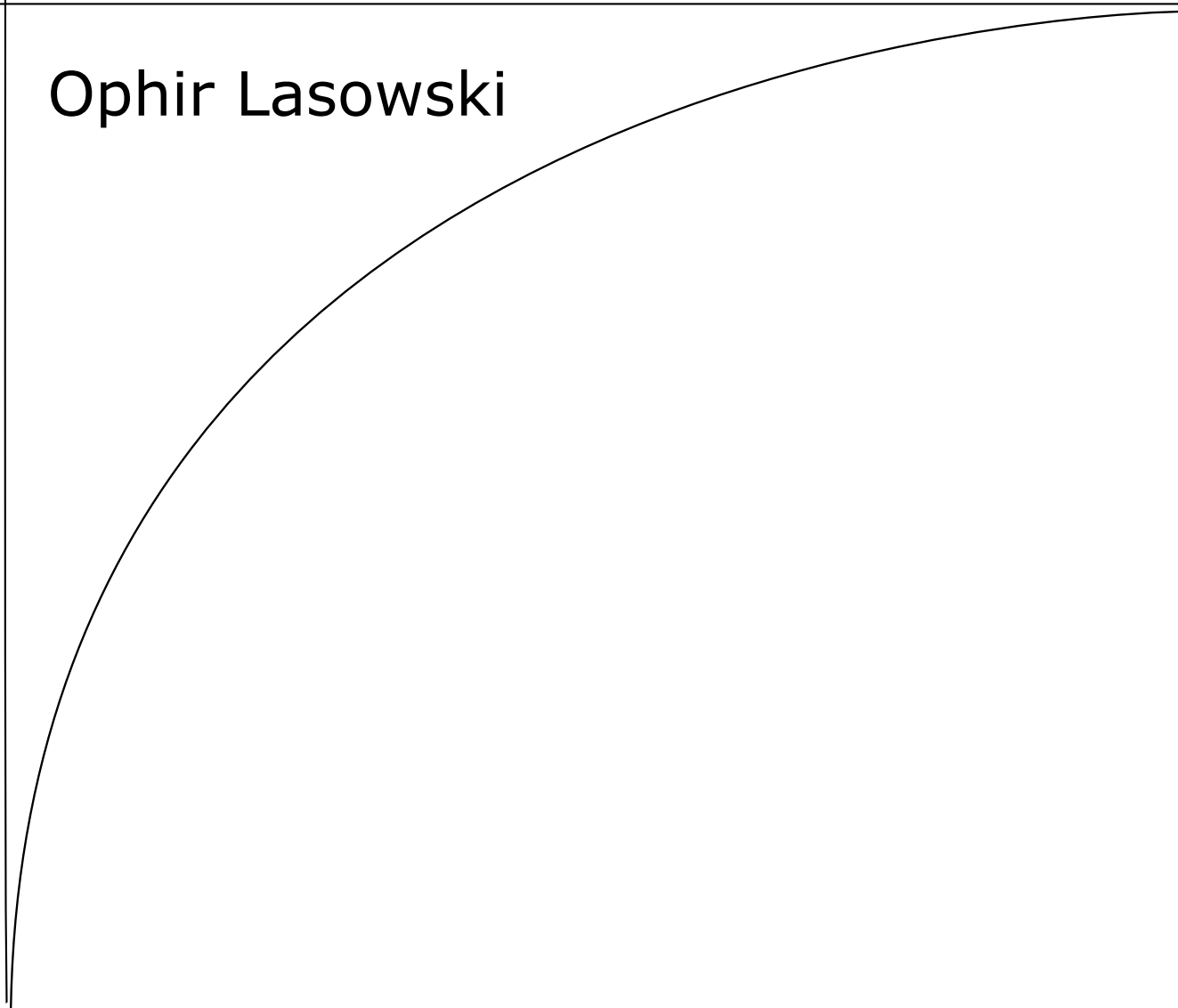
Co-Operative Groups in their Environments:

A Population-Ecological Model for Co-Operative Membership and Performance

Ophir Lasowski



Institut für Betriebslehre der Agrar- und Ernährungswirtschaft
der Justus-Liebig-Universität Giessen

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Dipl.-Ing. agr. Ophir Lasowski

Inaugural-Dissertation zur Erlangung des Doktorgrades im Fachbereich Agrarwissenschaften, Ökotrophologie und Umweltmanagement der Justus-Liebig-Universität Giessen

Dekanin:	Prof. Dr. I.-U. Leonhäuser
Eingereicht von:	
	Dipl.-Ing. agr. Ophir Lasowski
Gutachter:	
1.	Prof. Dr. Rainer Kühl
2.	Prof. Dr. Ernst-August Nuppenau

Tag der mündlichen Prüfung: 13.07.2010

Abstract

The aim of this work is to develop an alternative evolutionary approach to assessing the performance of co-operative organizations. The focus of investigation is turned to the co-operative organization as a group of members in a market environment containing non-members. Significant unique features of the co-operative organization is illustrated at first. After reviewing historical aspects of evolution theories and their positioning in biology, economic and social sciences, alternative notions of evolution and the osmosis of ideas is suggested. Further on, a concept for the evolutionary function of exit, voice and acquiesce strategies in social contexts is developed analog to the biological concept of fight, flight or cope reactions. Leaning on the known social and group-psychological features of the co-operative organizations species, and on the assumption of membership rationality at the individual member's level, a theory of exit, voice or acquiesce decisions, and the influence of the group's size on their results, is being introduced. A following empirical dynamic model will utilize the previous recognitions achieved, to demonstrate the effect of ommanent restrictions to group-growth. Moreover it is being proven, that the co-operative organization can still be considered as successive, in the populations ecological as well as in the social sense, even if it is not growing. A corrected approach to the utilization of group growth as indicator for co-operative performance is suggested as a result.

Keywords:
Cooperatives, Economic Evolution, Populations Ecology, Organizational Growth, Exit or Voice, Fight or Flight, Rationality, Memes

Zusammenfassung

Ziel dieser Arbeit ist die Entwicklung eines alternativen evolutionären Ansatzes zur Bewertung der Leistung genossenschaftlicher Organisationen. Im Mittelpunkt der Untersuchung steht die genossenschaftliche Organisation als Gruppe von Mitgliedern in einer aus Nicht-Mitgliedern bestehenden Marktumgebung. Einleitend werden für die Untersuchung elementare Eigenschaften der genossenschaftlichen Organisation geschildert. Nach einer Übersicht historischer Aspekte der Evolutionstheorien und ihrer Positionierung in der Biologie, den Wirtschafts- und Sozialwissenschaften, wird eine neue Vorstellung der Evolution und der "Osmose" von Ideen vorgeschlagen. Weiterhin wird ein Konzept für die evolutorischen Funktionen der strategischen Abwanderung/ Widerspruch/ Duldung in sozialen Zusammenhängen, als Analogie zum biologischen Konzept von Fight, Flight or Cope-Reaktionen präsentiert. Anlehnend an anerkannten sozialen und gruppenpsychologischen Eigenschaften der Genossenschaften und an die Annahme der Rationalität der Mitgliedschaft auf der Ebene des individuellen Mitglieds, wird eine Theorie über Abwanderung, Widerspruch und Duldung, und über den Einfluss der Gruppengröße auf deren Ergebnis, vorgestellt. Die zuvor erarbeiteten Erkentnisse werden im Anschluss in einem empirisch dynamischen Model umgesetzt, um die Wirkung immanenter Restriktionen des Gruppenwachstums zu demonstrieren. Weiterhin wird bewiesen, dass genossenschaftliche Organisationen weiterhin als erfolgreich beurteilt werden dürfen, sowohl im populationsökologischen als auch im sozialen Sinn, auch wenn sie kein Wachstum aufweisen. Ein weiterentwickelter Ansatz zur Anwendung des Gruppenwachstums als Indikator für genossenschaftliche Leistung wird als Resultat der Untersuchung vorgeschlagen.

Schlagwörter:
Genossenschaften, Evolutionsökonomie, Populationsökologie, Organizationswachstum, Exit, Voice, Fight, Flight, Rationalität, Memetik

ACKNOWLEDGMENTS

The first person I would like to thank is Prof. Dr. Rainer Kühl for giving me the unique opportunity to conduct research in his group. The freedom he provided me, to formulate the problem to be solved, to choose the scientific approach and develop the analytical method, enabled me to strike new paths into economic research. Going one's own way is always involved in moments of frustration and despair. It is thanks to Prof. Kühl's insistence and persistence, and his confidence in me which often exceeded my own, that made it possible for me to accomplish this journey.

Further on I would like to thank Prof. Dr. Ernst-August Nuppenau, my second supervisor, who commented my work, rightfully questioning my analytic methodology. In the very last moment, he significantly contributed to the quality of my work.

My further thanks belong to Prof. Dr. Hendrikse from the Erasmus University in the Netherlands, for his precious comments on my work and his valuable advice along my research.

Furthermore I would like to thank Dr. Axel Freier for the inspiring discussions, Maren Geisler and Volker Hart for their special friendship, and the rest of my colleagues, Tim Voigt, Dr. Jofi Puspa, Anne Piper and last but not least, Soviana. The friendly, supportive and academically inspiring interaction they all offered me, has not only shaped my work, but also the environment in which I have been living for the last few years, and I am grateful for that.

I would specially like to thank my family and close relatives for their encouragement and ongoing support. My particular gratitude belongs to my mother Leah and my father Israel, who never saved an effort to provide me with the best possible education, and who gave me the courage and the ambition to start and pursue a scientific career. Moreover I would like to thank my sister Inbar and my brother Lior who both – and each in a different way – give me models to look up to.

Last but in no means least, I would like to thank my dear wife Ruxandra for her love and patience, for leading me by example and showing me the path to walk up myself. Without her all this would not have been possible.

CONTENTS

Part I.

Introduction

CHAPTER

ONE

THE ROLE OF CO-OPERATIVES IN AGRICULTURAL AND FOOD MARKETS

Modern food retail chains demonstrate an ever growing tendency to perform internationally at the distribution as well as at the acquisition levels. The reduction of market imperfections such as trade barriers and of transportation costs for goods, persons, services and information, deliberates purchasers from geographical bounds and enables them to enjoy many advantages of the market globalization. The constant supply of fruits for instance, has become so obvious to European consumers, that many of them can't tell anymore when the strawberry season actually is. German consumers are not even surprised anymore to find strawberries on the supermarket shelves in the middle of February. Trade between different climate zones and even hemispheres makes this possible. But not only the luxury of summer fruits in the middle of the winter is made possible by trans-regional supply systems. Also a higher level of supply security of basic nutrition is guaranteed thanks to the geographical distribution of risks, and the quick availability of alternative sources of commodities in case of a regional supply crisis.

Growing buyer power in emerging markets encourages retailers, just like producers, to enter these regions and cut a slice of the growing prosperity in these lands. However, the geographic expansion of the operation regions also makes it possible - but at the same time necessary - for retailers to integrate variable sources from variable locations to secure their supplies. Three crucial aspects are to be accounted for in the context of international food retail: the first is the quantity, the second is the quality and the third is the price of the delivered products.

Large quantities are the most obvious direct result of expanding market activities. In order to operate internationally and rotate large stocks, highly developed logistics are necessary. Modern retailer chains are operating large-scale logistic centers, accumulating large deliveries and distributing over long distances to the chain-stores. For this purpose retailers are increasingly seeking for and depending on suppliers, who can provide them with large quantities of products. Moreover, large scale logistics make it difficult to control the quality of the products delivered. The main quality control and assurance activities conducted by big chains do not take place

along the logistic chain anymore nor at the time of purchase, but is rather based on customer response and complaint-management. Consequent quality problems are often becoming known to the retailer when it is already too late. Grave damages to retailers' reputation and customer trust are a risk faced by retailers and which must be minimized. In case of repeating customer complaints over a certain product, the retailer turns to the supplier, and in case no improvement can be achieved, an alternative supplier is being sourced for. Securing high - and not less important - constant quality standards, is increasingly a task, a commitment, a responsibility and an interest of the supplier. The flexibility and variability that are retained to purchasers through the possibilities opened by trans-regional and international sourcing, also make it easier for them to seek for the best opportunities on the markets. Suppliers are therefore forced to secure quantity and quality of deliveries and at the same time are exposed to high bargaining pressure of the purchasers.

As production location loses its significance to high quality standardization, low prices and aggregated supply of large quantities, agricultural commodities producers are forced to comply to these new demands. They do not possess bargaining power resulting from regional dependency of purchasers on their supply anymore. In order to be able to keep up with the new demands and compete with (sometimes geographically distant) alternative suppliers of similar products, growers are nowadays forced to find solutions for delivering large aggregated quantities of highly standardized quality products at competitive prices. Concentrating supply structures seems to be unavoidable under these conditions. However, in spite of the increasing industrialization of agricultural production, individual farmers are still far away from being able to satisfy the demands of food markets. The aggregated quantity demanded buy the typical retail chain is far beyond the dimensions of production of the typical agricultural farm. Now, like in the past, producers need to choose between either selling their product to merchants who aggregate the quantities delivered by many farms, or create their own marketing institutions.

The production of agricultural commodities is inherently bound to land. In the case of animal husbandry, for instance, it is the need to provide the stock with roughage, a factor which is hardly tradable and hence needs to be produced on the same farm, which determines a certain spatial distribution of agricultural production. Agricultural commodities are also specially characterized as bulky and perishable, which restricts their geographical mobility and implies high transportation costs, a feature which implies the creation of spatial markets. On the buyers side, both processors and producers are highly specialized. A given farm product can usually not be substituted by other inputs, nor can it substitute another one. High specialization on the production as well as on the processing level and high sunk costs implying high exit barriers for farmers and an inelastic supply [Rogers & Sexton, 1994], bound farmers to handlers and limit their choice of purchasers for their products. In case of losing access to a certain first-handler, farmers are forced to seek for alternative - sometimes distant - purchasers, which reduces the value of their product. These characteristics lead to spatial markets and buyer market power at the first-handler level.

Due to the danger of exploitation by large scale handlers, there seems to be no other alternative for the individual grower than to join forces and cooperate with other growers. Co-operative enterprises are perhaps the most intuitive answer for growers facing changing modern food markets. In order to countervail oligopsony power in agricultural markets, agricultural producers incorporate into co-operatives, facilitating the marketing and/or processing of their product, in which they can also influence the price they receive. Private agricultural product traders are thus forced to adapt their prices to the competition delivered by co-operatives. Hence, the existence of co-operatives in mixed markets influence the price level in the whole market, and by that, prevents it from falling too low. The notion that a co-operative may have a salutary effect on its rivals' pricing behavior is known as the "yardstick of competition" [Sexton, 1986a, Sexton, 1990] hypothesis. However, it immediately becomes obvious, that this market-regulation effect is an open resource, as not only members of the co-operative, but also the rest of producers on the market, benefit from this regulation effect. Moreover, as private actors set their trade conditions to compete with a present co-operative, opportunity costs are being created also for co-operative members. In such cases, where both co-operative and IOF alternatives are available on the market, the choice of the farmer for membership in the co-operative is not granted. In a market environment in which other actors are present, i.e. at any case in which the co-operative does not possess a monopolistic position in its market, member traffic into and out of the co-operative is to be expected. While the size of a (local) monopolist co-operative is limited by the size of the population of potential (local) members present in the market, in case of competition, the size of the membership is due to reach a state of dynamic balance at a level lower than the size of the population, while membership traffic is expected to persist. Part IV of this book features a model based on the assumption of existence of alternative marketing institutions besides co-operation on the market. That model features the detailed formulation of the mechanisms determining member traffic, and the resulting determination of the co-operative group size.

CHAPTER

TWO

ASSESSING THE PERFORMANCE OF CO-OPERATIVE ORGANIZATIONS

Co-operatives are not supposed to generate profits. Their actual purpose is to transfer their revenues to their members. How can the economic performance of an organization, which does not generate profits, be assessed?

The co-operative is not a non-profit organization per se, since its purpose is indeed to generate value. The main difference to other organization forms lies in the notion that profits are not generated within and for the co-operative enterprise itself, but are rather generated by and for the member enterprises. Since it is very difficult to gain access into the balance sheets of all member enterprises in order to accumulate the total co-operative performance, it is not an easy task to quantify the value generated by the co-operative. An indirect way to assess the value generated by the co-operative is therefore necessary in order to bypass the difficulties rising from its direct measurement.

The notion leading this work is that the co-operative is constantly being measured and assessed by its own members. According to the result of this assessment, conducted by each member, the members express their judgment through their behavior. Only members who observe a positive total utility from membership become or remain members of the organization. In that sense they actually vote by their feet. This characteristic of the co-operative organization is probably one of the main sources for biases in the results of empirical investigations of co-operative members' satisfaction.

Surveys, conducted on co-operative membership, include only subjects who are members of the organization at the time of the probe. Unsurprisingly, such surveys typically report a generally high level of satisfaction among the members. Unsurprising it is, and that is perhaps the most important assumption underlying this work, because those subjects who are not satisfied with the co-operative performance are not members of the organization. And all the members of the co-operative are therefore – by definition – satisfied with its performance at the time of the survey, otherwise they just would not be members. One could argue, that satisfaction is relative to a reference state, that is, the members could be better situated if the

co-operative would perform better in a certain aspect. But still, even without being able to name and measure all the different kinds of utilities members draw from co-operation, whether these are intrinsic social or extrinsic material and whatever the combination of these might be, one thing I can claim with a high level of confidence: The members of a co-operation draw a positive utility from co-operative membership. Indeed, his utility is relative. The point of reference is the utility that the members could draw from another alternative activity. That could mean to interact or exchange with another organization, whether of the same kind or another, or act independently on the free market of opportunities. Therefore, the utility from membership must be measured as a positive utility additional to the utility of the alternative.

In order to create a concept for assessing the performance of co-operative organizations, which would incorporate the intra-organizational as well as the market-system performance of the organization, this work features an attempt to imply an evolutionary theoretical perspective, measuring co-operative performance by using population ecological tools. Assuming:

- Rationality of co-operation
- Competition: Existence of alternatives on the market and
- Implying an evolutionary perspective,

the co-operative organization and it's performance can be assessed in terms of evolutionary fitness. The evolutionary perspective on organizational performance implies the definition of populations and environments at each level of observation. Deviating from the classical population ecological perspective of organizational economics, the basic unit of the population, defined in this work, is not the organization. Neither it is the life cycle of the organization which is the basic process yielding the outcome of the species' fitness. In this book, the co-operative organization serves as the analogy to the environment of activity for the members, who in turn, feature the basic unit of the population. The members, however, are not considered to multiply or perish in their environment, much more it is they who select the environment in which to be active, according to their individual interests, capabilities and the performance of the environment itself, in satisfying the members' interests and corresponding to their capabilities.

Taking on an evolutionary path of thought, it is unavoidable to refer to the milestone works of Richard R. Nelson and Sidney G. Winter. The assessment of evolutionary fitness of organizations has been coined in Nelson and Winter's work *"An Evolutionary Theory of Economic Change"* [Nelson & Winter, 1982]. The logical structure at the base of their model [Nelson & Winter, 1982] could be constructed in the following scheme:

i If in time interval $(t, t+n)$, enterprises that innovate exist along with such that do not, then the enterprises that innovate generate higher profits than those that do not.

ii If the profit of certain enterprises in a time interval $(t, t+n)$ are higher than the profits of others, then the enterprises which generate the higher profits increase their capitalization.

iii The enterprises with the higher capitalization have the lower probability of exit than the enterprises with lower capitalization.

iv If the exit probability of the enterprises with higher capitalization is lower than that of enterprises with lower capitalization, then in the long run, if the interval $(t, t+n)$ is long enough, only the enterprises with higher capitalization will exist in the market.

v Conclusion: If there are enterprises existing, which innovate in time interval $(t, t+n)$ and such enterprises that do not, then after a time interval $(t, t+n)$ long enough, only the innovating enterprises would exist at the end of the interval.

If claims *(i)-(iv)* are true, then claim *(v)* must logically also be true. As later referred to by Nelson and Winter themselves [Nelson & Winter, 2002] and by Witt [Witt, 1987], Friedman[1] suggested that the (economic) natural selection argument is based on *"profit induced growth"*. Let us now engage Friedman's element of organizational expansion into the logical scheme constructed above. It implies that:

1. Innovative enterprises increase their capitalization.

2. Capitalization increase implies organizational expansion.

However, it has already been recognized by economists, that:

3. Organizational expansion retards the innovation rate (i.e. a decrease in relative research and development expenses)[2].

4. Retarded innovation enforces a retarded increase in capitalization.

5. Over the period of time $(t, t+n)$ long enough, innovation and expansion reach a static balance (An optimal innovation rate is being determined).

We can see, therefore, that confronting the apparently dynamic model of Nelson and Winter with other known notions of innovation, leads the system to a static equilibrium. The (originally unwanted) state of equilibrium resulting from the construct of the model by Nelson and Winter [Nelson & Winter, 1982], after its confrontation with innovation theories, lies in the organizations population perspective of the model.

[1]For Friedman's concept refer to [Friedman, 1953], p. 22, and to its references in [Nelson & Winter, 2002], p. 27, and in [Witt, 1987], p. 78

[2]Retarded innovation being induced by increasing inertia, longer decision processes as well as slower adaptation capability.

Although at the organizational population's level, an expected state of stagnation should cause worries for the equilibrium aversive economic evolution theorist, this source of worries is eliminated if the theorist keeps the constituent parts of the organization itself in mind. As argued in chapter 7 later in this book, the notion of the organization as the selected entity is due to ignore the individuals constructing the organization itself. Only a concept that bears regard to the processes within the apparently static organization, would succeed to describe the dynamic prevailing within the system.

In order to target this weakness of typical evolutionary approaches to economic issues, this work attempts to suggest a concept which would also consider the basic – atomic – particles constructing the socio-economic system; the individual interactors. People, and their behavior.

CHAPTER

THREE

THE CONCEPT OF INVESTIGATION CONDUCTED IN THIS WORK

The object of investigation of the present work is the economic and social phenomenon named co-operative organization. In order to define the co-operative, as the subject of this analytical investigation, it would be appropriate to consider the way co-operatives view themselves by examining the principles that lie at the basis of these organizations. The International Co-operative Alliance (ICA) [ICA, 2009] defines the co-operative as *"an autonomous association of persons united voluntarily to meet their common economic, social, and cultural needs and aspirations through a jointly-owned and democratically-controlled enterprise"* [ICA, 2009]. This definition is a sum-up of the co-operative principles and the premises under which the co-operative organization needs to perform. The first feature of the co-operative, named by this definition, is the feature of autonomy. As an autonomous, meaning a self governing entity, the co-operative as an organization enjoys the freedom to choose its own way and carries the responsibility for its decisions and their consequences. The organization sets its aims and targets and executes the measures to achieve those.

As an association of persons, the co-operative is defined as a group, also in the social and socio psychological sense of the word. Being a voluntary union of persons, acting as a bona fide group, the organization features and maintains a distinctive group identity and well defined boundaries [Oetzel & Robbins, 2003]. At the same time, distinctive boundaries are an essential element for creating a group identity.

In order to create perceived influence of the individual on the group's culture and on group decisions under a democratic set-up, the group must maintain limited - easy to grasp - dimensions. These boundaries become harder for the organization to realize and for the member to perceive, the bigger the group gets. Defined group boundaries, together with the group culture, provide the additional value which creates, alongside with the economical value, the necessary compensation and therefore the necessary condition for group participation of the individual member.

A prerequisite for a scientifically valuable recognition is an understanding of the common, the replicable and the repeated. *"The scientist seeks to understand the*

common, the ordinary so as to be able to appreciate and understand that rare, extraordinary event" [Freeman, 1995]. The aim of the present work is to suggest an alternative broader perspective for the assessment of cooperative organizations, which incorporates the different interests and interest conflicts of the individual members. The end of this quest should deliver an instrument, which would save the need to survey for these interests and conflicts and the combination between them for the individual case, and enable their measurement through observation of the organization's behavior from an external perspective. The performance and the quality of the co-operative, although determined by the judgment of the individual member, should therefore be expressed as an attribute of the whole organization.

To make that possible, a deeper understanding of the phenomenon called the cooperative group, its dynamics and the different forces acting within and upon it, is indispensable. This work will attempt to contribute to this holistic understanding. The thesis at the base of this work is the claim that the performance of the cooperative organization is just as good as the entirety of its members wish it to be. The assessment of the organization's performance is being conducted by all its members continuously and simultaneously. According to their assessment of the organization, the members express their judgment by voting with their feet; given that there is an alternative to membership existing, members can choose to join or exit the group according to their personal preferences, costs and utilities.

Based upon this understanding, it should be possible to evaluate the quality of the organization through observation of the behavior of the entirety of the members. The dynamic traffic of members into and out of the organization should provide an indicator for its performance as it is being evaluated by its – potential and present – members. For the purpose of this evaluation, a multi-level viewing of the cooperative organization is being designed and implemented. The following three levels of observation, and moreover, the boundary between them, is to a great extent arbitrary and should mainly serve for the constructed analysis. The defined levels are:

- The individual: The basic element constructing the organization is the individual member. This work will investigate members' interests and motivations, the satisfaction and fulfillment of these interests, and the dependency of their satisfaction on the structure of the organization. The results of this investigation will enable the model formulation of members' preferences and evolving choices considering their membership (Exit/Voice/Acquiesce).

- The organization: The analysis on the organization's level will embrace the influence of members' behavior on the structure of their organization (growth model). The organization, for that purpose, is being observed as the population of the entirety of its members, and an evolutionary rationale is being implied.

- The environment: The absolute performance of the organization is being set in its relation to its market environment and the dynamic organization-environment-individual behavior interrelations and influences are analyzed.

The evolutionary role of the co-operative, as an instrument to create competition advantage, and its role as a possible socio-economic elevator for its members in its market environment, are demonstrated on this level as well.

As obviously can be seen, these three mentioned levels of observation are hard to separate from each other. Consequently, the analysis is due to concentrate also on the dynamic relations and influences between the processes happening at the overlap between these dimensions. To be considered is the resulting relationship triangle and the conjunction areas emerging between these levels:

- Individual – Organization
- Organization – Environment
- Environment – Individual

The focus of examination on the individual agent's level is the rationality of the exit-voice-acquiesce decision and its evolutionary rationale. For that purpose, a rather abstract definition of innovation as any change in pattern of action or behavior is chosen for this work. Following this notion, any abandoning of one pattern for another is by definition an innovation in the evolutionary sense[1]. This work will try to sample few of the mechanisms determining the individual's interests, motivations and decisions. The complex of these interests, motivations and resulting decisions is the actual force driving or inhibiting, and the actual source or barrier of innovation in the sense of acting differently.

After handling strategic decision making on the individual's level, the focus of analysis in this work will turn to the next level, the organizational level, where the dynamic relations triangle – organization structure, member traffic and environment – actually comes into expression. The connection between the size of the organization, the members' preferences and resulting membership choices, and the way these interact with the organizational environment, and influence each other in a reciprocative manner, are all demonstrated at this level of observation.

In order to establish the foundation for this notion, a review of the logic of the economical evolution concept, in the light of recently achieved insights into biological evolution, genetics and epigenetics, is being conducted in part III of this work. Part IV features the integration of these recognitions and their implementation into an empirical theoretic model.

[1]The notion of "acting differently" (translated from German: anders handeln, O.L.) has been comprehensively discussed by Axel Freier in [Freier, 2007], p. 47.

Part II.

The Socio-Psychological Features of the Cooperative Organization

CHAPTER

FOUR

THE RATIONALITY OF COOPERATIVE BEHAVIOR

In contradiction to some traditional theories of groups, empirical researches have shown that the human being does not feature a natural tendency to belong to big organizations and groups. Much more it is a rational - if not an opportunistic - choice of the individual to belong to a collective group. In his book The Logic of Collective Action [Olson, 1965], Mancur Olson Jr. has stated the purpose of any group or organization as to act for some collective advantage, which must benefit all members of the certain group. Although all members of the group have a common interest to achieve this advantage, they do not have a common interest to carry the costs of this achievement. Each member would prefer to let the other members carry the full costs of achieving the group's purpose and enjoy the benefits of the collective action, whether he or she has taken a share in achieving them or not.

According to this logic, it is plausible to observe the relationship between the individual and the group as an exchange relationship; the individual member contributes a share of the effort involved in the group's action which determines his costs for membership. In exchange, the member receives a share of the group's achievement which is the product that the group supplies to the individual member. Each individual in the group determines a different value for group's product and expects this value to be higher than his or her share on the costs, as a condition for being (or remaining) a member. As demonstrated by Olson [Olson, 1965], the total costs of the collective action would rise over-proportionally as a function of the production quantity, just like the costs of any other - non collective - product. Establishing the formal organization and installing the production system for the product (which might just as well be a certain service) would cause high start-up and fix costs. The first unit of production would therefore be over proportionally expensive. Due to mass-production the price for the single unit of production decreases. This decrease in the cost becomes ever smaller as the quantity is increased, until it reaches a certain minimum. Up from this certain critical quantity of the collective production, the price of the single unit of the collective product is increasing. Assuming that the production quantity of the group must be increased when the group expands, it is therefore inevitable that the share of production costs of one of the members

exceeds his or her value for the group's product at some point.

From the perspective of the single member, an expansion of the group means therefore a decrease in the quality or benefit of the collective product. That is exactly the case which Albert O. Hirschman addresses in his work "Exit, Voice and Loyalty" [Hirschman, 1970]. According to Hirschman, the options of exit or voice are substitutive choices of the agent (who may be a customer acquiring the product or services of a firm, or a member of a political party, who chooses to support its ideology or vote for an alternative competing party) in reaction to a decline in the quality of the product, service or ideology offered to him by his supplier. Adapting Hirschman's concept to our case of co-operating groups, we consider the member to be facing a situation, in which he or she needs to decide between either giving up the group membership for the sake of an alternative source ("exit"), or raising his or her voice in protest ("voice") in order to prevent the decline of its value. Hirschman has observed the costs of exit as a barrier, which would prevent the member from abandoning the organization and motivate him or her to choose the option of voice. Low exit costs on the other hand would increase the tendency of the customer to abandon the organization without raising protests, which would not give the organization an inducement to improve or correct its weakness[1].

However, as Zhu, Hendrikse and Krug demonstrate in their work Relational Entrepreneurship in Local China [Zhu *et al.*, 2006], exit and voice can perform complementary. Agents who possess low exit costs and therefore a well available option to abandon their contracting party, possess more bargaining power, their threat to abandon is more credible, and are therefore more likely to have a stronger influence on their counterpart. They are therefore more likely to choose the option of voice, since they have better chances for increasing the quality of the product supplied to them, and that for lower costs than the option to exit would involve.

In the situation that the group-member is facing, as the value of the membership decreases, the reaction options of exit and voice are complementary as well. The member has the option to attempt blocking the entrance of a new member, or abandon the group immediately. However, this decision between exit and voice is influenced by the costs and the probability of influencing the group, which are in turn a function of the size of the group. Hence, as demonstrated later in this work, the growth of the group is stimulating the frequency of abandoning the group within the population of members, retarding in turn the growth itself.

[1]For the significance of voice for the organizational management refer to p. 37 in [Hirschman, 1970].

CHAPTER

FIVE

THE INTEREST OF THE GROUP TO KEEP GROWING

Groups are different in their tendency and interest to grow. Some special types of groups, like football clubs, religious communities, clubs of common interest such as motorcycle clubs and so on, gain their recognition and prestige, and their members gain their confirmation, merely through their ability to attract as many members as possible and demonstrate constant growth. In football clubs, for instance, there is probably no other measure for their success other than the number of registered members. Religious streams receive the confirmation of their doctrines through the acceptance of those by new followers. That is, however, not necessarily the case for any group. Especially, but not only, members of common material interest groups tend to feature a tendency for exclusivity. However, even religious groups very often determine high entrance barriers for their membership. In some cases entrance may be acquired only after going through a long examination procedure. In other, more extreme cases, entrance into the community is only made possible by birth or marriage. A typical example is provided in the work of Egbert [Egbert, 1998] concerning a Muslim ethnic-religious group in east Africa.

However, that does not necessitates that the group must consist of a small cultural religious and ethnic isolated community in order to exclude itself from non-members. Every state formulates a list of conditions which must be fulfilled by a person in order to receive its citizenship. So at the bottom line, every group attempts to provide the advantage or utility it creates exclusively to its members and deny access to others. Those who are not members are excluded from the benefits created by the group, whereas the threat of exclusion is being utilized as a measure of pressure on existing members to accept the rules of the group [Egbert, 1998].

Furthermore, the group must feature perceivable borders in order to ensure the perception of the advantage of being a member. Without being able to identify the borders of the group and the positive difference between being and not being a member, the individual has no incentive, neither intrinsic nor extrinsic to be part of the group, and the group loses its value. From this point of view, the group itself should not be expected to feature a strong tendency to infinitely keep growing. However, the group we characterize is an established enterprise of a certain

significant size, featuring a management organ, which might have the interest to expand its activity, at least for the sake of its professional or personal satisfaction or prestige. Our basic assumption is that the management does not have the interest to lose members or, in other words, to reduce the size of the group constructing the organization. Nevertheless, as argued in chapter 22 further in this book, a stagnation in the process of growth occurs whenever one member of the group objects to the growth continuance. Once this situation occurs, it is out of the influence of the management to prevent it. Much more, the management needs to decide between choosing to satisfy and keep the old member, or to lose this member and accept the new membership candidate. Keeping the old member would most certainly ensure a further stagnation in the growth of the group, which might not be the interest of the management. On the other hand, losing the old member for the sake of accepting the new one is also involved with a certain risk, as the new member and her or his performance are not yet known. This risk must also be considered as a cost for the group.

To sum it all up, the interest of the group to keep growing must be considered as a private case. Each group would feature a specific interest to grow, which can only be expressed as a demand curve for growth. Each group would feature a different price elasticity for growth and would be ready to pay a different price for a certain marginal growth. Moreover, there is no general rule for which member, the existing or the future candidate, the group should prefer in order to achieve its growth target value. Each group would create a private case. For the purpose of this work we assume the group as an indifferent organization i.e. the organization has no significant preference between the new and the already existing member. However, convincing the group to prefer the already existing member over the future candidate is assumed to involved certain costs, proportional to the number of members who need to be reached through communication. This assumption plays a significant role in the construct of prices of exit or voice determining the opportunistic preferences of the protesting member, as illustrated in detail in chapter 21. That opportunistic behavior of the individual member is therefore the only factor influencing the characteristic growth, formulated in the model construct, presented in chapter 22 of this work.

CHAPTER

SIX

THE STRUCTURE AND GROWTH OF COOPERATIVE ORGANIZATIONS AS AN ADAPTATION PROCESS

A necessary characteristic of an organization, whether human or non-human, to ensure its performance and viability, is its ability to adapt itself to its dynamic environment or to different environments. Adaptation can take numerous forms on different levels. On the operational level, an organization might adapt its capabilities by gaining knowledge or experience, or by changing its equipment or processes. On the strategic level, an organization can adapt as a strategic response to its changing environment by adapting its design, by changing its size or its structure, or it can do these in combination with shifting to another environment[1] in order to secure its advantage and its survival.

Organizations are related to as a collection of agents when considering their adaptation at the operational level. Adaptation at the strategic level is being observed as decisions from "above", which are being applied and enforced by principals and executed (or not) by agents. This view of organizations can fairly well be applied to organizations with distinctive hierarchies and principal-agent roles. In such an organization there is a central organ, the CEO or a central unit, which directs adaptations processes in the means of certain changes in the organization's design. This central unit controls the set of agents which form the organization, the way this set of agents is structured, the distribution of knowledge, information and tasks between these agents and the connections between them. Over time the central unit or CEO of a hierarchic organization attempts to optimize the design of the organization by taking steps of change which they suppose would move the organization closer to a given set of goals they previously define. The purpose of these steps of changes is to achieve an optimal state[2]. However, many kinds of cooperating groups, whether of humans or non-humans, lack this distinctive hierarchy feature. At least in some aspects of the organizational design, every member of such a group is at the same time a principal and an agent at their own sake.

[1] An environment in the economical sense could be a market, a product, a branch or even a geographical location or a political system.

[2] Corresponding to the predefined set of goals.

The distinctive feature of the co-operative organization is that it belongs to its own members. That means that the organization is a collection – a group – of the agents whom it is supposed to serve. Whether the organization is successful in serving the member's purpose or not, has the direct consequence of the agent's being a member or not. In other words, the fact that the individual agent is a member of the organization is a result, and at the same time an indicator, that the organization is serving its purpose. If the individual member sees an advantage in being, over not being a member, the organization is successful in serving its purpose; otherwise the member would have exited that organization. Therefore, there is not much room for the discussion of the question whether a co-operative is successful or not, it's mere existence is the only necessary proof for its success, at least as much as it might concern its members. But the influence of the individual members on their organization does not end at this point. Much more, the agents determine the design of their organization by their own decisions and actions.

One of the aspects in which the members of a group shape the organization, is the size of the organization in the sense of the number of its members[3]. A central unit or a CEO of a hierarchic structured organization might attempt to direct the adaptation process of the organization to what they consider to be its optimal size under a given set of environmental conditions. But for open membership groups (like co-operatives), where the members are free to join or leave voluntarily, the optimum of the membership size is being determined quite differently. When it comes to determining the number of agents acting within the group, the agents themselves determine the optimal state. The optimal size of the organization is defined by each of the members. The organization may therefore be considered as being at a state of dynamic balance. Any change in the environment of the organization causes a movement of agents into or out of the organization and therefore an immediate adaptation of the organization to the new conditions.

In a co-operative group, the state of dynamic balance is being adjusted from within the organization more than from an external (or central) strategic point of perspective. Therefore, opposite to the common proposition about hierarchic organizations, a co-operative group adapts its size by itself, as part of its continuous operation, and this adaptation is therefore more similar in its characteristics to adaptation at the operational than at the strategic level.

This feature of the co-operative is significant for the understanding of the unique limitations in implementation of organizational adaptation strategies. Both the "market power" [Porter, 1980] and the "resource-based" [Wernerfelt, 1984] approaches to business strategy, relate to the single firm as the adapting unit. Accordingly, both of these perspectives take for granted the ability of managers to control what firms are doing and how [Freeman, 1995]. What is the significance of the level and locus of control for the formulation of approaches of strategic management? As formulated by John Freeman [Freeman, 1995], *"the answer is simple–if the people making strategies are not also in control of the organization, then strategies will often re-*

[3]In distinction from its economic size.

main unimplemented; and unimplemented strategies are irrelevant"[4]. In that sense, in order to determine which and whose strategies are relevant, we must first find out who is in control of which feature of the organization. This is especially applicable to the strategic determination of organizational size, when applied to the co-operative organization. If we ought to develop a strategic tool for the determination of the optimal size for the organization of the type "co-operative", it is crucial to first understand where and by whom the size of organizations of that type is being strategically determined.

[4]Refer to page 219 in [Freeman, 1995]

Part III.

The Evolution of Replicators, Interactors and Environments: Evolution Theory in Economics and Biology

CHAPTER

SEVEN

INTRODUCTION TO PART III

The last two decades have witnessed a renaissance of evolutionary thinking in social sciences in general and in economic sciences in particular. The main effort of scholars exploring evolutionary economics is still aimed at trying to recognize the potential explanatory powers of evolutionary approaches to economics, highlighting the gaps in economical research that may be closed by evolutionary paradigm and exploring the limits of the evolutionary logic in understanding economics as a human phenomenon. A lot of contemporary works are still occupied with defining evolutionary theory itself and its criteria. Attempts to imply the evolutionary paradigm as an alternative to "traditional" economic approaches to specific social questions and problems are still very rare. Before I turn to such an attempt of implying evolutionary approaches to explaining a specific phenomenon in part IV of this book (in this case the forces and mechanisms determining the growth of human groupings in general and co-operative groups in particular), in this chapter I will first attempt to deliver a partial insight into evolutionary theory and its economic and historical development. Based on my undoubtfully limited insight into this discipline I shall attempt to suggest some adaptations to the evolutionary approach, which might be necessary contributions to the implementability of the theoretical construct to specific economic "practical" issues.

CHAPTER

EIGHT

DARWIN IN THE ECONOMICS SCHOOL

In biology, and closely followed by economics, Darwinism has been the established synonym for evolution in the last 150 years. According to Darwin's theory, evolutionary change occurs as a result of variety generation, natural selection and transmission of characteristics, enabling the well known notion of the "survival of the fittest"[1]. The main principles of Darwin's theory are based on the notion, that each population of a given species reproduces more offspring than the environment can support. This leads to competition between members of the population (interactors), in addition to the competition with other species. According to the Darwinist concept, many of the offspring population are due to perish, only the fittest survive.

The survival of interactors or their longer life expectancy would mean an increase of their chances to set offspring, transmitting characteristics similar to their ancestors' to the next generations. In a given environmental set up[2], this offspring would possess the replicators, determining its characteristics securing its "evolutionary advantage" over its competitors, increasing its probability of setting offspring and so forth. Darwin, at his time, had not been provided with scientific insights into the mechanisms of heredity and could therefore not provide a detailed explanation for the way it occurs. Relying only on evidence and theoretical logic, he was certainly venturous to publish his theory "On the Origin of Species" in the year 1859, being aware of the difficulties he could not solve and exposing his theory to critics. But coping with limited informations and the readiness for academic debate is probably only a partial expression of Darwin's scientific greatness. It had not been until few years later, as Gregor Mendel 1865 had published his findings from experiments in plant breeding, providing the evidence for heredity through "particles", formulating what was first related to as "Mendel's Law" and known nowadays as "Mendel's Rule" of heredity.

[1] "Survival of the fittest" is a phrase coined by the philosopher Herbert Spencer, who actually criticized Darwin's theory from a position of evolutionary understanding more similar to that of Jean-Baptiste Lamarck. I shall discuss Lamarck's theory later in this chapter

[2] It is not intended to claim here that a given environmental set up can exist. It is actually the constant dynamic change which drives evolution

These recognitions not only provided the complementation of Darwin's theory to neo-Darwinism, but also established the basis for the following genetic science after 1940. Later scientific recognitions about molecular genetics and their mechanisms have supported Darwin's concept. Molecular genetics have delivered the explanation of variety generation through spontaneous mutation, combination and recombination of DNA molecule sequences. According to Darwinist evolution theory, the organism itself does not have a direct influence upon the complex characteristics its genome possesses or the expression of these characteristics in its phenotype. All mutations take place spontaneously and randomly, and only at the phase of exposure of this phenotype and its characteristics, abilities, capabilities and weaknesses, it is being selected according to its inherited fitness.

Although the influence of the organism on its environment is considered in the context of ecology and populations ecology, the environment itself is still considered as exogenous conditions for selection. The influence of the organism on the environment is indeed part of the factors determining the selecting environment, but no intended adaptation of the environment is attributed to the organism. Taking for example the ability of Penicillium fungi to produce toxics and by that reduce threatens from bacteria by inhibiting the formation of peptidoglycan in their cell walls, no intended elimination of bacteria can be attributed to the mushroom. The ability to produce these toxic substances is considered to be a characteristic generated by coincidental mutations, which on their hand secured the evolutionary advantage and survivability of Penicillium fungi in an environment rich in bacteria.

The attribution of passivity to the organism and the total coincidence of variety generation are the main internal weaknesses of biological evolution as an analogical basis for the analysis of social and economical evolution, and are only part of the elements exposing it and the applicability of neo-Darwinist evolutionary logics to social sciences to critiques.

Economics and biology have mutually influenced each other over the centuries [Hammerstein & Hagen, 2005]. The inspiration of Adam Smith's work on The Wealth of Nations on Darwin's theory is widely known. Quite soon after the broad acceptance and establishment of Darwinist evolution in biological thought in the second half of the nineteenth century, Darwin's distinctive ideas have been soon drawn back into social studies. Biological metaphors have always been present in economic theory, and the ideas of competition and struggle in the writing of Smith and Thomas Robert Malthus simultaneously inspired economics and biology. However, there has been a strong variation in the popularity and intensity of use of biological metaphors in social sciences and in economics over the twentieth century.

As Nelson and Winter recognized in their review of evolutionary theorizing in economics [Nelson & Winter, 2002], after being widespread in economics during the first several decades of the twentieth century, having evolutionary strands and concepts contained in many textbooks and journals of economics prior to World War II, evolutionary thought seems to have vanished from social sciences in the early post war period [Nelson & Winter, 2002]. In that review, Nelson and Winter point out the increasing fixation of neo-classical economic theory on equilibrium conditions,

and the mathematical formulation of that theory, as the cause for the disappearance of evolutionary thought from microeconomic theorizing after the war.

But much more than the cause, this has probably only been the symptom. The decline of biology in social sciences was not the direct cause for the turn of economic theorists to mechanistic modeling. Stark reliance on mathematics has evidently taken the space left open by absence of evolutionary perceptions from sociological and ideological – just as much as economical – thought, as well as politics and, to an extent, perhaps even emotions, in the early decades of the twentieth century [Hodgson, 2005][3].

The historical overview of the progress of relationships between biology and economics can be divided into three academic-cultural-lingual spaces, as suggested by Hodgson [Hodgson, 2005]: The German, the British and the American. In all three zones there have evidently been two distinctive directions of biological paradigm in social sciences. The one being the use of organic or biological analogies to describe and explain social and economic phenomena. The second, the explanation of human behavior as purely biologically conditioned and society itself as an organism.

In the German-speaking world, the notion of the "social organism" was the subject of contention in the two decades long dispute known as the Methodenstreit, opened by Carl Menger in 1883 [Hodgson, 2005]. The core issue of that dispute was the roles of individual and society and the relationship between them. Extensive comparisons between biological and social organisms and strong organic metaphor had been manifest in social sciences during the rise of the German historical school [Hodgson, 2005][4], attributing features of a growing organism with its own mind and will to the social system. Karl Menger did not target the use of organic metaphor in social sciences for itself. Much more he targeted the idea of the "social organism", with its attributes of own purpose and will. But the controversy over the legitimacy of biological analogues in social sciences lead to skepticism towards the validity and applicability of biological logics, and consequently, towards biological analogies in social sciences.

In Britain of the 1870-1920 period, biological reductionism was prominent in social sciences. The belief that human individual behavior and the resulting social progress are originated in and determined by human genetic legacy was widely established. The concept of eugenics has found widespread following in Britain and American social sciences. The main influence in the last three decades of the nineteenth century was that of Herbert Spencer, who attempted to build a complete system of thought that would embrace both the natural and social sciences. Influenced by the German theorists, Spencer's concept of socio-economic evolution was more similar in its leading logic to the biological evolutionary theory by Jean Baptiste Lamarck[5] rather than to that of Darwin, stressing the organism's adaptation to the environment rather than the selection of organisms by the environment [Hodgson, 2005][6].

[3]See [Hodgson, 2005], p. 127
[4]See [Hodgson, 2005], p. 109
[5]More to the evolutionary theory of Lamarck in the following section 9 of this work
[6]See [Hodgson, 2005], p. 111

However, different from the leading organicist notion of social organicism dominant in the German school, Spencer's concept was deterministic, individualistic, reductionist and atomist, addressing society in the mechanistic terms, popular in the Victorian era of the industrial evolution. His concepts had a broad influence, inspiring influential economic theorists, among others John Maynard Keynes and Alfred Marshall.

Marschall's Spencerian biology had fallen out of favor soon after Spencer's death in 1903. In the light of Darwin's acceptance as the only true biological evolutionary theory, economic theory influenced by Spencer's biology has been abandoned by economics scholars altogether with biology itself as a source of inspiration. Marshall's influential successor Pigou [Pigou, 1928] turned instead to physics for inspiration and to the notion of the firm in a state of equilibrium. The concepts developed under the influence of Pigou's notion of equilibrium were inconsistent with the existence of heterogeneous agents. Under the absence of heterogeneity and variety from mainstream economics, Darwin's biological evolutionary principle of variety generation and selection could not anymore be utilized for economical analysis.

In USA as in Germany and Britain, organic analogies were widely adopted into economics, in great extent due to the strong influence of the German historical school on American economics [Hodgson, 2005][7]. However, a major discrepancy existed between the streams of pragmatist philosophy and the instinct psychology developed by William McDaugall [Hodgson, 2005][8], which argued that much of human behavior was dependent upon inherited instincts, assigning biology a main role in shaping human society on one hand, and the stream of interactionism and anti-reductionism which, while acknowledging the biotic foundations of social life, resisted the view that human behavior could be explained purely and simply in terms of genetic inheritance [Hodgson, 2005][9]. However, Veblen[10] embraced Darwinism and proposed that the Darwinian principles of variation, inheritance and selection should be applied to economics, whereas institutions serve as the units of selection. These notions laid the ground on which American institutionalism had grown. Both the German historical school and American institutionalism possessed the same limited perspective of Darwinism as a synonym for biological evolution, leaving theorists no other option but to either accept biology as the driving force behind individual and social behavior and as the the analogue model for economic evolution, or reject evolution with its biological connotation altogether. This rejection had been enforced by ideological and ethical developments in America during the first decades of the twentieth century. Later on, following the trauma of World War II, Darwinian thinking in social sciences, including the principles of inherited competencies, competition and selection, was drawing connotations of early evils and was not anymore politically correct. It has not been before the seventies until evolution returned to be named aloud in social and economic research contexts.

[7]See [Hodgson, 2005], p. 113
[8]See [Hodgson, 2005], p. 114
[9]See [Hodgson, 2005], p. 114
[10]As cited by [Hodgson, 2005], p. 114

The first who actually dared calling the evolutionary stream of thought in economics "evolutionary economics", were Nelson and Winter in the beginning of the nineteen seventies [Hammerstein & Hagen, 2005], [Nelson & Winter, 1982], [Nelson & Winter, 2002], [Witt, 1987]. Their evolutionary economics are inspired by the early work of Schumpeter [Schumpeter, 1934] on the role of innovation in economic change over time. Schumpeter suggested innovation as the major force behind economic change. According to his theory, innovative technology of a firm creates profit until competitors imitate it. The loss of innovative advantage and the profits it creates motivates the firm to innovate repeatedly. There is an obvious discrepancy between this dynamic underlying economic evolution and the broadly accepted neo-Darwinist notion of variety generation through mutation. As mentioned earlier in this section, biological mutation after Darwin assigns a rather passive role to the organism. The coincidence of biological "innovation" remains problematic for implication in the social sciences as long as Darwinist selection, based on random mutation, is considered as synonym for biological evolution. This discrepancy forces the distancing of evolutionary economists from biological analogy, which prevails till this day [Witt, 2005]. More to that in the following sections.

Although featuring certain differences in its origins, and although different in its periodical phases in the three cultural spaces mentioned above, the academical and ideological dispute over the use of biological, genetic and evolutionary terminology in social sciences featured a common point of focus. The main issue of the debate has been the influence of human biology and evolutionary history on the behavior of individuals and social groups. That actually applies to the methodological dispute, even after evolutionary metaphors gained entrance back into social sciences and economics in the seventies of the twentieth century. However, this dispute has been rather ideological than scientific in its character. Undoubtedly, human behavior is determined to great extent by culture and society. But Although certainly not determined exclusively by genetics, human behavior and psychology are indeed influenced by human biology and instincts. The term "Human Nature" is indeed a complex notion. However, perhaps it is not at all necessary to solve the question, to what extent is human behavior determined by its genes. There might be no gain for the understanding of the mechanisms of economical development and social change, if the relative significance attributed to nature or nurture in psychology is determined to the extent of an absolute value. Searching for the mechanism of variety generation ultimately analogue to DNA replication might not be constructive contribution to the understanding of system and social developments. Much greater advances could be gained if the biological analogues in economics are abstracted and separated from their original context. A further investigation of that notion is conducted in chapter 15 of this work.

CHAPTER

NINE

EVOLUTION AFTER JEAN-BAPTISTE LAMARCK

It is difficult to find any paper approaching social and economical evolution without mentioning Lamarck and his evolutionary theory of adaptation mechanisms and the inheritance of acquired traits. But non of these actually presents neither Jean-Baptist Lamarck himself nor his evolutionary theory to its details, and analysis its principles as to explain its rejection from biological evolutionary theory and consequently the dissociation of biological from economical evolution. I shall therefore start this section with a short summary of Lamarck's life and legacy[1].

Jean-Baptiste Pierre Antoine de Monet, Chevalier de Lamarck (1744–1829) was a French botanical and zoological scientist. Born as the eleventh child of an impoverished aristocrat family he followed the request of his father and enrolled in a Jesuit college in Amiens in the late 1750's with the aim to become a priest. After the death of his father in 1760, Lamarck joined the French army, which was engaged in the Pomeranian war against Prussia at the time. After showing bravery in combat and being nominated for lieutenancy, Lamarck got injured and posted in Monaco, where he encountered James Francis Chomel's botany book "Traité des plantes usuelles". In 1766 Lamarck quit the army and attempted to study medicine and botanic in Paris. Under the persuasion of his elderly brother he gave up his medicine studies after four years and followed his interest in botany. After publishing a three-volume work on French flora in 1778, which launched him into prominence in French science and helped him to a membership in the French Academy of Sciences in 1779 and a commission as a Royal Botanist in 1781.

Lamarck worked for five years as keeper of the Royal Herbarium before being appointed curator and professor of inverberate zoology at the Muséum National d'Histoire Naturelle in 1793. Before the year 1800, Lamarck was still holding the position common in that era, that species are constant in their features. Only through his work on the fossil mullocks of the Paris basin he became convinced that transmutations or change in the nature of species occurred over time. The variety of species he became acquainted with and the apparent gradual increase in complexity of species he observed brought him to his developing idea about evolution. On

[1]For a comprehensive presentation of Lamarck's life and work refer to [Packard, 1901]

the 11 May 1800 he first presented an outline of his newly developing ideas about evolution. In 1802 he published *"Recherches sur l'Organisation des Corps Vivans"* in which he presented his theory of evolution. According to Lamarck's perception, life was organized in a vertical hierarchic chain, with gradation between the lowest and the highest forms of life, featuring a path of development in nature. In his later book *"Phylosophie Zoologique"* from 1809 he argued that every species was due to exist in harmony with its environment, and since the environment was in a constant change, species had to constantly change as well.

Lamarck, who was a materialist in his belief, relied on the recognitions of chemistry and physics of his time to explain the two basic forces he noted as comprising evolution:

- The power of life: Organisms tend to progress up a ladder of complexity and increasing order. Life was believed at Lamarck's time to be constantly – spontaneously – generated (observed, for instance, as the worms appearing on rotting waste). Natural movements of fluids in living organisms, according to Lamarck, drove them toward ever greater levels of complexity.

- The influence of circumstances: While adapting to their environment, organisms can be driven off the ladder of complexity progress into specialized form of local adaptation. The interaction with the environment and the resulting use or disuse of different characteristics was considered by Lamarck as the power behind the adaptive force of evolution.

Regulated through the intensity of use of their different organs, living creatures lose characteristics which they do not need and develop other characteristics that they do, strengthening organs that they constantly use. The complementary principle of Lamarck's evolution was the inheritance of acquired characteristics: Living creatures inherit the characteristics they developed (through the use of organs) to their next generations.

Famous examples used by Lamarck to demonstrate his evolution theory are that of the giraffe's neck and the development of muscles. Through stretching its neck in order to reach the leaves of the highest trees, the giraffe lengthens its neck, developing a characteristic which it then inherits to its offspring. The iron smith develops his muscles through his work, and inherits these on to his sons.

Lamarck's theory of evolution was wide-ranging. It included continual spontaneous generation of simple forms of life, progressive change caused by the inherent tendency of living matter to become more complex, modifications brought about by the increased use or disuse of organs and parts in response to environmental conditions and the inheritance of such modifications [Jablonka *et al.*, 1998]. However, in modern biology, at least until the last decades of the twentieth century which featured new insights into inheritance mechanisms and the development of epigenetic theories[2], Lamarckism is usually equated with the inheritance of acquired characters. That applies both to biological as to social sciences.

[2]For a more detailed review of Epigenetics refer to chapter 11 of this book

CHAPTER

TEN

THE REJECTION OF LAMARCK'S EVOLUTION FROM BIOLOGY LEADING TO REJECTION OF BIOLOGY FROM SOCIAL SCIENCES

The central dogma of molecular biology relies on the theory of the biologist August Weismann, who formulated the idea of the so called Weismann Barrier during the 1890s. According to Weismann, the hereditary material passed from parents to offspring (germ-plasm) remained separated from the material composing the body of the organism (soma). Thus, sequence information is prevented from flowing from proteins to nucleic acids. That implies that genetic information can only flow in only one direction:

DNA –> RNA –> Protein

Following this concept, molecular genetics have completed the chemical explanation for Darwinian heredity. Darwin's evolution, based on spontaneous mutations (creating variety) and environmental selection, has become the synonym for evolution in biology and – consequently – the point of reference for evolution in social sciences and economics. Keeping Spencerian concepts of social evolution aside[1], social evolution theorists generally refer to an apparent biological evolution based on Darwinian mutation and selection, and therefore demonstrate an obvious restraint from the direct applicability of what they perceive to be the biological evolution into social and economic evolution.

The modern strand of evolutionary thought in economics is inspired by the early work of Schumpeter [Schumpeter, 1934] on the role of innovation in economic change over time [Hammerstein & Hagen, 2005]. The economic evolutionary element of variation generation through innovation is not analogue to the biological mutation in the sense that organisms do not conduct research and development activities, and do not decide about their next strategy of changing. Moreover, ontogenetic in biology refers to the regular systematic unfolding of the individual organism, subject to environmental conditions but determined by the individual's genetic pro-

[1]For a detailed overview of Darwin's and Lamarck's positioning in social evolution theory refer to [Hodgson, 2001]

gram [Witt, 2005]. Obviously, as recognized by Witt, organizational or institutional changes, the subjects of economic evolution, are not driven by the same causation common within species in nature such as the expression of a genetic program, related to change in Darwinian biology.

A great portion of the difficulties in creating an economic evolution theory, featuring elements isomorph to biological evolution, originate in the fact that economists are obviously not familiar with resent recognitions achieved in the field of biological sciences. Modern biology turns to feature much more mechanisms of Lamarckian evolution than economists seem to be aware of. Examples for the (obsolete) biological evolution paradigm of economical evolutionists can be found in the formulations of Witt [Witt, 1987, Witt, 2005], Foster [Foster, 2005], Nelson and Winter [Nelson & Winter, 1982, Nelson & Winter, 2002] and practically anybody who writes anything on the subject of economic evolution. Taking another look at resent developments in biologists' understandings about change and inheritance processes in nature, might save economic and social evolution scientists a great deal of trouble.

CHAPTER

ELEVEN

NEW EVIDENCES FROM BIOLOGY AND THE EPIGENETIC EXPLANATORY MECHANISMS

Although in the last years, thousands of articles, numerous scientific meetings and a new journal were devoted to the subject of epigenetics [Bird, 2007], the term and the idea seem not to have reached the conscience of evolution economists. It is perhaps time for economists to take notice of this new understanding of natural phenotypical and genetical change. It is not, however, the aim of this book, nor it is my pretension to be able to deliver a complete review of the science of epigenetics. Much more it is my wish to turn the reader's awareness to resent achievements in the biological explanation of trans generation inheritance. These new recognitions of biology suggest that biological evolution might be much more Lamarckian than the socio-economist might think.

The term epigenetics, which translates as "in addition to genetics" stands to describe and explain mechanisms of changes in phenotypes, which do not originate in changes in the underlying DNA sequence. It therefore excludes the inheritance of mutational changes. Nevertheless, such epigenetical changes may withstand cell divisions for the remainder of the cell's life and even last for multiple generations.

Examples of trans generational epigenetics are now well documented in plants and fungi. Data on epigenetical inheritance mechanisms by animals are still scarce. However, their potential to shift our understanding of inheritance, from genetical determinism to the Lamarckian antidote of the possibility that acquired marks can be passed over to following generations, has sparked the general imagination [Bird, 2007]. The significant recognition of epigenetics is that the experiences of an organism at one generation, the air it breathed, the food it ate, even the things it saw, have a potential direct influence on the life of its offspring, even decades after, although the offspring might never be exposed to the same experiences.

At the molecular level, the post synthetic modification of gene expression are occurring without alteration of the DNA itself. Several known inheritance mechanisms may play a role in epigenetical cell memory [Jablonka *et al.*, 1998]. The broadly accepted mechanism, suggested as an explanation for the chemical modification of DNA, which can be inherited and subsequently removed without changing

the original DNA code, is the activity and influence of the so called chemical marks. Eucaryotic cells' genome carries different chemical marks which are added to either DNA or chromatin proteins [Suzuki & Bird, 2008]. This epigenetic information is regionally variable and signals or preserves local activity states, such as gene transcription or silencing. The sum of these information in the genome is the epigenome. Unlike the genome, the epigenome is highly variable between cells and fluctuates over the time span of cell's life according to conditions even within a single cell. There are therefore at least as many epigenomes as there are cell types [Suzuki & Bird, 2008]. One large-scaled distributed epigenetic mark in normal tissues and cell types is the DNA methylation [Suzuki & Bird, 2008]. DNA methylation is perhaps the best characterized chemical modification of the chromatin [Goldberg *et al.*, 2007]. The chemical marks on the genome determine the activation or silencing of certain DNA sequences. This mechanism is responsible for the differentiation of embryonic cells into different cell types and tissues with different functions. One way to describe this notion is as an analogy to a cookbook. All the cells in our body carry the same cookbook, but different cell types are using different recepies. The genetic information for making the epithelial cells of the skin is turned off in the neurons and vice versa. Such epigenetic variations remain preserved through the process of cell dividing. Although most epigenetical changes happen during the differentiation of cells from the embryonic fertilized cell, the zygote, or from stem cells during the organism's life, further changes occur at later stages of development and life.

Such epigenetical changes are responsible for the observed differences in disease susceptibility of mono zygotic twins, which suggests that epigenetic differences that arise during aging are at work [Fraga *et al.*, 2005]. Early maternal nurturing has been shown by Weaver et. al. [Weaver *et al.*, 2004] to have a life-long-lasting effect on DNA methylation, affecting offspring' response to stress by rats. Rat pups which have been nurtured by their mothers have shown a reduced tendency to fearfulness, compared to pups which have been less nurtured by their mothers. Such a differentiation might explain a mechanism through which differential parental behavior can alter the psychological characteristics of the offspring and by that prepare them to different environments [Weaver *et al.*, 2004]. *"Maternal effects on defensive responses to threat...commonly follow from the exposure of the mother to the same or similar forms of threat and may represent examples whereby the experience of the mother is translated through an epigenetic mechanism of inheritance into phenotypic variation in the offspring. Thus, maternal effects could result in the transmission of adaptive responses across generations"* [Weaver *et al.*, 2004].

Further epigenetical mechanisms of stable and even inheritable gene expression variations should only be mentioned, but cannot receive a detailed description within the scope of this work. The first group of these would be covalent and noncovalent chromatin variation mechanisms, which work together to introduce meaningful variation into the chromatin fiber, and whose collective contribution to epigenetics is only now being rigorously explored [Goldberg *et al.*, 2007]. A further mechanism that should be mentioned here is the influence of noncoding RNA. It has recently become evident, that noncoding RNAs have a hand in controlling multiple epige-

netic phenomena. These RNAs often act in concert with various components of the cell's chromatin and DNA methylation machinery to achieve stable silencing of DNA sequences. Some of these invoked silencing effects are long-term effects that can be inherited through cell division [Goldberg *et al.*, 2007].

The gathering evidence of epigenetical mechanisms strikes our imagination, because it delivers explanations for potential effects of the environment on the expression of genes. The possibility that patterns of DNA-marking, acquired during the life time of one generation can be passed to the next generation, has a *"...deliciously lamarckian flavor that proved difficult to resist as a potential antidote to genetic determinism"* [Bird, 2007].

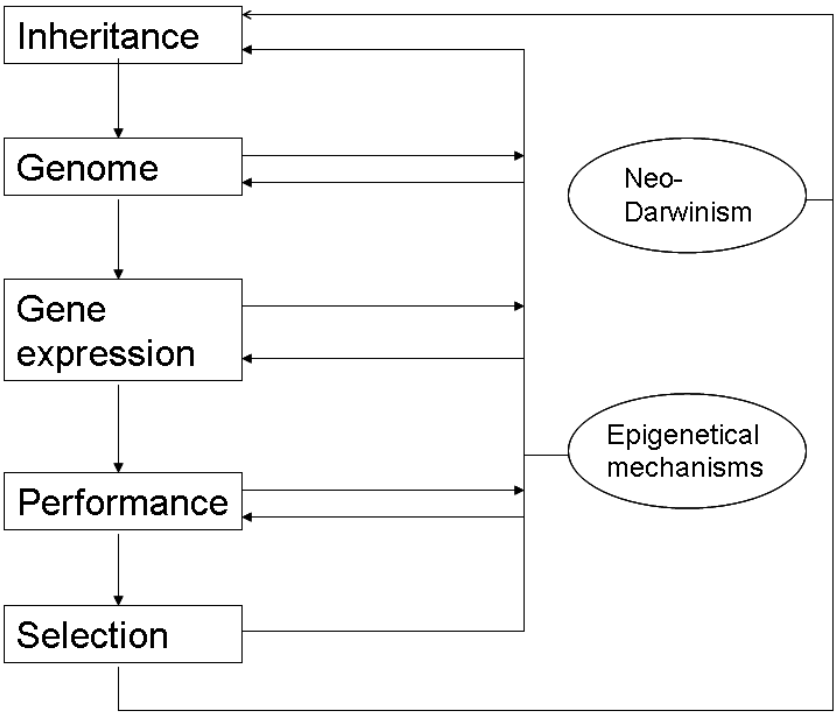

Figure 11.1.: Epigenetical Influence on Evolution's Scheme

The significant modification to the general flow of evolution lies in the additional and direct influence of experience on the expression of the genome. The (neo-) Darwinian evolutionary schema defines a rather strict chain of correspondence between inheritance, the genome and environmental selection. The epigenetical paradigm suggests additional paths of correspondence between selection, gene expression, organism's performance and the genome, as illustrated in figure 11.1.

CHAPTER

TWELVE

IMPLICATIONS OF LAMARCKIAN LOGIC FOR ECONOMIC EVOLUTION

The insight that social and economic evolution features the logics of Lamarckian evolution is not new to evolution theorists and meta theorists. Evolution economists indeed recognized the weaknesses of pure Darwinist logic in explaining economic and sociological development processes. However, variation from this reasoning or dissociation from it has been conducted in a very hesitant manner and expressed with a rather apologetic spirit. Attempts at the extension of Darwinism beyond the borders of evolutionary biology through further abstraction, have been conducted in order to create the heuristic concept of universal (sometimes named "general") Darwinism, keeping the three main principles of Darwinism at their core of evolutionary theorizing: blind variation, selection and retention [Witt, 2008]. In other cases, researchers almost seem to have had a rebellious thrill as they turned to search for an economical evolution theory deliberated from the *"burdens of ideas borrowed from biology"* [1] or biological analogies. That is probably due to the perceived general acceptance, virtual hegemony, of neo Darwinism in biology over the best part of the twentieth century. And perhaps due to the still persistent self esteem of economics as a natural science.

Hodgson [Hodgson, 2001] recognized a problem arising from the recognition of the Lamarckian characteristic of social evolution and opened his essay stressing that *"The prevailing wisdom in biology is that Lamarckian ideas are untenable, at least in the biotic context."* raising the apparent question of *"...theoretical inconsistency between biology and the social sciences"* and adding to it the resulting dilemma *"Can we be Lamarckian in the social sciences and Darwinian in biology? Is there a contradiction here? Can we be Protestants and Catholics at the same time?"*.

However, recent[2] evidences and recognitions in biology, supporting the validity

[1] Translated by the author from [Witt, 1987], p. 88.

[2] If the above mentioned contribution of Hodgson [Hodgson, 2001] in a journal dedicated to Darwinism and evolutionary economics should be considered as representative, it is only an astonishing demonstration of the slow pace and low intensity of exchange between the two disciplines; the biological and social sciences. That is although they claim to be sharing the same logics

of evolutionary principles, originally formulated by Jean-Baptiste Lamarck already 50 years before Darwin had published his evolution theory, might spare economic theorists the need to "take sides" and either accept or reject biologic evolution logic per se.

The adaptation of Lamarckian evolution theory also to economics, may release economic theorists from the danger of having a bad ethical conscience (or even the risk of being blamed for racism) while maintaining the position of economics as a discipline cognate to natural sciences. At the same time it would enable theorists to highlight some evolutionary mechanisms and principles crucial for the understanding of social and economic processes.

Refering to ontogenetic change of organizations, Witt [2005 p. 349] mentions literature dealing with organizational life cycle that *"...rely on the analogy to regularities of ontogenetic morphological development of single organisms in nature"*. He then questions this idea of organizational life cycle by raising two questions:

- *"A first and very basic question that may be raised is why organizational change should be expected to give rise to stereotypic developmental patterns such as succession of organizational states. Since there is nothing comparable to a common causation like the genetic program, which expresses itself, it is not clear where a stereotypical development corresponding to the life cycle metaphor should come from".*

- *"A second question is what organizational features one should look for in seeking empirical evidence for analogies to the systematically changing morphological features of organisms. Development may be expressed by changes in the structure or quality of an organization (as they are indicative of morphological development). However, there is no eye-catching empirical evidence for stereotypic changes in organizational structure or quality as there is evidence for the development of organisms".*

As for the first question, this problem can be solved through a rather Lamarckian understanding of development in nature. Actually there is much less of a common causation like the genetic program in nature itself than pure Darwinian evolution might suggest. The genetic program might determine the ways an organism could regulate its mechanisms of change. It can determine, for instance the capability of an immune system to learn to resist a new antigen. But it does not, and does not need to, contain all the programs for developing antibodies for all possible antigens. The basic notion of Lamarckian evolution is the adaptation of not only the patterns themselves, but also the adaptations of the patterns for pattern adaptation. The second question becomes superfluous if the unprogrammed Lamarckian change is being accepted, as there is no more of a programmed morphological change in natural organisms than could be expected for organizations.

The Lamarckian concept of evolution allows a simultaneous influence of both phylogenetic and ontogenetic development of organisms. Adaptation of Lamarckian

and semantics

logics would provide the legitimation for the application of adaptation processes as means of variety generation in the sense of evolutionary innovation. Lamarckian rationale allows for a much more active role attributed to the organism as well as to the social entity in shaping its own development than the Darwinian mutation-selection thesis. The choices, decisions and the resulting behavior of the organism, stimulate changes in its own organ, which in their turn are being transfered to the following generations of that organism. This notion allows the acceptance of an interactionist perspective, stressing that the agent and the environment are both the outcome of the last process [Hodgson 2005, p. 114].

CHAPTER

THIRTEEN

SELECTION AS A RATIONAL DECISION OF THE SELECTED ENTITY

Economic evolution in the theory of the firm, as we know it, is based on the Schumpeterian inspired notion, formulated by Nelson and Winter [Nelson & Winter, 1982], of selection in populations. Following the principles of Darwinian selection, Nelson and Winter define efficiency of organizations in making profit as the determinant of their survival. The result and therefore the indication for organizational evolutionary success is its expansion and size[1]. A very basic question should be raised: Don't profitable enterprises ever exit?

Especially the agricultural production market demonstrates a high rate of abandoning of survival-capable enterprises. Not the enterprises themselves are the entities that perish, but much more it is the idea, or the behavior, of running these enterprises which are being abandoned.

According to Nelson and Winter's rationale, the population of organizations divides itself into organizations which grow and expand, and those which decline and disappear. Although very often denied, this evolutionary mechanism implies a very simple and rational criterion for survival. Moreover, it implies a population equilibrium. If the enterprise is profitable, it would continue not only to exist, but also to expand. If and only if it is not profitable, it will exit. In the organizational economics, the focus of discussion is how to define exit as part of the life cycle of organizations, at the organisations population level. Organizations disappear from the population in different ways. Organizations can dissolve, but they can also disappear when they merge into or being taken over by other organizations. What ever the case may be, the exit of the organization is not always being externally enforced, much more often it is a result of a conscious decision of the entrepreneur(s) to discontinue its activity in the same form in which it has been active till that point.

This is a grave difference between economical and natural selection and evolution.

[1]The size of an organization as an appropriate measure for its fitness or success will be questioned again in part IV of this book

Whilst one of the very basic rules of nature is the general urge to live, economic survival is much more often a matter of a rational decision.

A crucial understanding of the process of economic selection would be achieved through detailed formulation of this decision at the level of the individual entrepreneur. A general formulation of a decision equation is needed for that purpose. This equation should contain the list of factors, motivations and incentives contributing to and contributed by the continuance of the organization's activity. A specific dependency of these factors on external conditions and internal organizational features must be formulated for the specific case. These factors must then be set in comparison to alternative opportunities, in order to determine the critical break even point.

CHAPTER

FOURTEEN

CONCLUSION OF THE DISCREPANCIES BETWEEN BIOLOGICAL AND SOCIO-ECONOMIC EVOLUTION

Evolution in biology is a concept that demonstrates high validity through out all its levels and the different fields of life sciences that involves. A harmonic continuance prevails all the way from the single atom, investigated in the field of physical chemistry, through the field of biochemistry, explaining biology at the molecular level, on through anatomy and zoology to population ecology. All these levels of life sciences are investigated with the same tools, under the same assumptions, they accord to the same set of rules and are being applied each level as a complimentary explanation to the others. No recognition in molecular genetics stands in contradiction to nuclear physics and population ecology is constructed on the basis of genetical explanations. The insights and knowledge collected through scientific investigation is revealing the great mosaic of understanding life and nature one stone after the other. Each recognition in physics, taking for example contemporary insights into nano physics, can open ways and horizons for bio-chemistry, cell biology (and by that to medicine). At least up to this point, the principles known to life sciences at all levels and disciplines harmonize with each other. It is more likely, that a new recognition in one of the many life sciences would change the way the whole picture of nature is being understood. But it is rather unlikely, that a recognition at one level would break the continuance that prevails among all life sciences. It is therefore unlikely, that a phenomenon in cell biology would imply a new and special chemical theory, independent from and unexplainable by the known chemistry and physics. Such a recognition might serve as an empirical evidence, that might demand adaptations to the theories of physics and chemistry, but it would probably not suggest an additional set of alternative physical and chemical conceptions.

Evolution in socio and economic sciences has not reached such a state of harmony yet. For the purpose of investigation, let us divide the socio-economical spectrum into three major levels: The individual (person, actor, agent) would serve as the basic unit of investigation (analogue to the electrons, protons and neutrons, building the atoms and up to the level of single molecules in the natural system), the institution (firms, groups, communities) as the analogue for the organism (from the level of

the single cell up to a whole organism), and the economic system, including its market niches, as the analogue for the ecologic systems with the populations of firms included in it. Obviously, this division is artificial. The individual actor can act as a firm in the population and in the market environment, whereas the relationship of the single cell with the organism can feature a relationship with its environment, featuring operative characteristics of a market just as much as the organism maintains market relationships with its environment and – simultaneously – with the rest of its own species. Chemical ion-exchange processes can be observed as a market (for electrons) just as much as an ecological niche could. However that is perhaps due to the continuance in the principles driving nature, more than in those driving social phenomena.

Economic evolution at the individual level entails difficulties with the direct application of Darwinian evolution logics, as the perspective of the latter is strongly directed at changes at the population level. Only through the application of Mendelian genetics, biological analogies start to provide contemplates for the analysis of change at the individual level. However, the analysis of economical evolution using biological semantic reaches its borders very soon. Biological evolution specifies genes and phenotypes. The genes are the set of information, saved in the form of sequences of chemical molecules (DNA) determine the organism's capabilities of producing a certain set of proteins and feature a certain set of characteristics, being together the organisms phenotype. Genes variation occurs through spontaneous combinations and recombinations of DNA sequences. These variations occur as a result of environmental influences (such as radiation or chemical substances) or as a result of programmed mechanism well integrated into the process of reproduction. That means, through built in mechanisms of multiplication imperfections at the stage of cell devision and multiplication, reproduction itself serves as a variety generation mechanism. A certain amount of "mistakes" is integrated into the transcription process of the DNA during the generation of reproductive cells. Another mechanism of variety generation is the actual notion and the reason for sexual reproduction. Through the combination of genetical information of two individual organisms, another mechanism of variety generation is created. The optimal portion of variation during the transcription of genes is secured by the mating borders of the species and is being optimized by evolution itself. Obviously, an optimal level of variation is not only the force driving change in species, much more it is a key for survival itself. However, variation itself is a random process. The organism itself cannot have an influence over which characteristics it receives from its ancestors and which it inherits to its offspring. The organism also does not have a control over which of the genes it carries should be expressed. The phenotype is being enforced on the organism and they are both being selected by the environment. This is different in evolution in the economic context. The individual interactor possesses a charge of information and knowledge and is acquainted with a certain variety of possible behaviors it can choose from. According to the information it possesses, its replicators, the interactor can choose to switch between behaviors in order to adapt to changes in the environment or as reaction to the consequences of its behavior. How-

ever, the interactor can alternatively switch to another environment according to its assessment of the different environmental constellations and the possible consequences of each of its behavior alternatives. In case of uncertainty, the interactor can experiment with patterns of behavior, of which consequences are not known yet. The interactor itself, however, is not necessarily being selected, and if so, the replicators it possesses are not necessarily being selected out of existence with the interactor. There is therefore very little common to the genetical constitution and the replicators of the social interactor.

Analogue to the explanatory role of biochemistry for life at the organism level, there should be a logic continuance between the individual interactor and the replicators it possesses, and the organization as the "next" organic level. The evolution theory at the firm level seems to have been developed as a theoretical aggregate, independent from the lower level, the individual. Since the publishing of Nelson and Winter's milestone book [Nelson & Winter, 1982], the widely accepted basic element of economic evolution at the organization level is the routine. Routines are conceived to help identifying the evolutionary principles of variation, selection and inheritance in economic change. They are supposed to provide the unit of analysis of economic evolution [Becker, 2003].

Routines are considered to contain a collective nature, which expresses itself through the interaction they consist of. Since they imply a repetition, they are widely referred to as "recurrent interaction patterns, that is, collective recurring activity patterns" [Becker, 2003]. Without the collective nature, "recurrent activity patterns on the individual level best fit the term 'habits'" [Becker, 2003]. According to that notion, in order for a routine to be such, it needs to be possessed by an organization, that is, an interaction system of more than one actor. That exclusive definition raises questions considering its general applicability. Before the industrial revolution, as many of the professions have been practiced by individuals, was the craftsman only in the possession of habits? Was the smith not working according to routines he developed for his workshop? And in modern days, as ever more free lancers provide their services and their skills to more or less big organizations they do not become part of, does the individual free lancer not imply routines, both in his own activity and in his interaction, just like the organization he is working with? Obviously, the collectivity that derivate from the element of interaction is not a necessary condition for the existence of a routine. A routine can be individual and still be more than just a habit. Moreover, if we agree, that routines are applicable to individual action and behavior, there is still a difficulty concerning the nature of the linkage between the cognitive and the behavioral levels. Do firms or organizations feature their own cognition? Can a behavior be attributed to an organization? Obviously, the organization cannot be understood without consideration of its basic element, its individual members, including their cognitions and behaviors.

An additional feature related to organizations is the natural metaphor of a life cycle. According to this notion, an organization goes through a pattern analogue to the life cycle of an organism, from its grounding (birth) through its growth on to its exit from the market (death). The point of time in which an organization

is being grounded can often be defined. The processes of its development can be followed and documented. However, there is no common causality determining the path of change for all – or any subgroup of – the total of organizations, analogue to the genes in nature [Witt, 2005]. But the most problematic stage in the life cycle of organizations is the one that should define their analogue death. As already quite early recognized [Penrose, 1952], there are many ways and patterns in which organizations seize to exist. Firms are supposed to be selected through competition in markets [Hannan & Freeman, 1982], which may lead to bankruptcy, take-overs, mergers, break-ups or management buy-outs.

However, the individual actors – persons, people – who are the basic elements combining the organization and, at the same time, possessing the single elements of the organizations routines, continue to exist independent from the organization itself [Hannan & Freeman, 1982][1]. Moreover, in the last decades, ever more firms are grounded as start-ups, aiming at developing, maturing and patenting an idea. Such firms are not meant to transfer the idea into production or application in the first place, much more they are aiming at selling themselves, together with the idea they possess, to larger firms which then apply the ideas or eliminate them according to their strategic preferences. By being dissolved into other firms, these start-up firms actually achieve their goal and are therefore cases of success rather than failure[2].

If there is no element perfectly analogue to natural death in the context of organizational evolution, where is the process of selection actually taking place? Hannan and Freeman [Hannan & Freeman, 1982] argue for parallel development of theory at both organizations population and, what they define as, organizations community levels. In that sense, the single member provides an aggregate of analysis with the organization as a population of members. The second aggregate of analysis is the population of organizations. At both levels they suggest the common fate, as a consequence of organizational success or failure at the organization's level, and the consequence of environmental variations at the organizations' population level. This solution of identifying the population by the common fate, drawing the populations borders according to homogeneity in terms of organizational environmental vulnerability, does not provide a solution for the methodological identification of organizations species. It only enables a backward oriented identification of populations, in the sense that a group of organizations featuring a common vulnerability to a certain environmental change are then superficially declared a species. Identifying a species by a shared environmental vulnerability does not help in the definition of species in the biological sense, since natural selection determines the fate of a subgroup within the species. That means, the subgroup eliminated by selection is not the whole species but a characteristic variation within the species' population. The borders of species in nature are well defined through the borders of genetical combination. Since there is no perfect analogue to natural replication and reproduction in the socio economic context, the definition of organizations' species still

[1] Refer especially to page 934 in [Hannan & Freeman, 1982].

[2] These cases are often the counterparts – the antithesis – of "make or buy" decisions. they could perhaps be named "make or be bought" decision cases.

remains unsolved.

Since selection in the biological and socio-economic contexts implies a fundamentally different consequence for the survival of the interactor, as the social economic interactors are not selected out together with their replicators, there must be a fundamentally different motivation prevailing for the reproduction of ideas. In biology, the general motivation of organisms to survive serves as a general axiom. The aim of nature is maximum survival of the genes [Koslowski, 1998]. Since death is an integral part of life cycle, the only form of survival for the genetic load of an organism is given by reproduction and genetical inheritance. In the socio-economic context, reproduction of knowledge and competencies occurs through different forms of communication. One part of the communication forms are motivated by both parties, the delivering and the receiving. Such would be publications, documentation, oral presentation, courses, reports, consulting or apprenticeship.

A second part of the communication forms is motivated and conducted solely by the receiving part, through observation, imitation, copying and back engineering. A third part of communication is motivated and enforced only by the delivering party. That would be the case of, for instance, institutional or social norms, regulations and restrictions. However, no communication takes place in case non of the parties are motivated to transfer information. That is not the case in biological replication. Organisms are indeed motivated to maintain their genome. Since variation in the genome is taking place spontaneously during the process of replication, the organism does not have a perfect control over the genetical charge it inherits. That surely applies to the communication of ideas as well as interactors are often exposed to ideas they do not actively choose to know. But the offspring of natural replication cannot select the genetical charge it receives and even more, the genes it features in its phenotype, which is quite different from the socio-economic case. The choice, the selection, the interpretation and the way of implementation of information and ideas communicated in social and economic exchange systems lie all in the hands of the receiving party of communication. The organizational analogy to natural reproduction and inheritance is therefore imperfect.

As formulated by Edith Penrose [Penrose, 1952], one should ask the question, is a perfect socio economic analogy to biological genetics and evolution necessary? If so, should it be observed as an explanation, or just as a metaphor? Hannan and Freeman argued, that "Populations of organizations referred to are not immutable objects in nature but are abstractions useful for theoretical purpose" [Hannan & Freeman, 1982]. A further abstraction in the socio economic concept of evolution, achieved through a shift in the focus of analytical observation from the organization or the interactor as the basic units of populations, is suggested in the following chapter 15.

CHAPTER

FIFTEEN

THE EVOLUTION OF IDEAS

15.1. Socio-Economic Survival of Ideas

Perhaps because economic theorists fancy their image as a discipline at the overlap between social-behavioral and natural sciences, economic evolution theory attempted to follow the well accepted Darwinist logic, or at least hold to it as the pivot point and a reference notion to variate upon and experiment with. In evolution economics, the notion of ideas (routines, habits, skills, information or rules of conduct) is utilized as an analogy to the biological notion of genes, as the unit of information storage and transfer. The complex of ideas possessed by the reproducing and selected entity[1] is considered as analogue to its genome, and the capability to make the evolutionary advantageous choice and the implementation of these ideas, together with structural and capability attributes of the deciding entity, partially determined by these very same ideas, are all elements of the entity's phenotype. Selection processes apply to these phenotypes, determining their further existence or disappearance.

It did not take long, however, before economic evolutionists reached the limits of Darwinist principle mechanisms' ability to explain or even describe human behavior, civilization systems and their development. Whilst evolution economics have been conceived as having the potential to release micro economic theorizing from the ties of rationality and equilibrium, the pillars of neo-classical economics, theorists have not dared distancing themselves from Darwinist thinking to full extent. The Darwinist evolutionary notion of mutation as means of variety generation receives its analogy in socio-economical evolution in the generally adopted concept of Schumpeterian innovation (Schumpeter, 1934). However, neo-Darwinist perception of spontaneous mutations (mistakes occurring during DNA transcription, or recombination of DNA molecules triggered by chemical or physical influences) as solely means of generating variety, could not accord with the notion of innovation, being the basic power driving economic evolution.

[1]That could be an individual or an organization, as the context of observation may be.

While spontaneous mutation assigns a rather passive role to the interactor itself, innovation demands a very active role of the innovating actor, raising problems and questions concerning innovators' capabilities and – even more than that – motivations. A purely Darwinist explanation of innovation would imply that all innovations are the results of either mistakes occurring during information transfer, or lessons learned from mistakes occurring in processes[2]. Such an explanation of innovation would expropriate the human spirit from its innovative drive.

An additional problematic lies in the identity of the entities being changed and those being selected. In biological evolution, the offspring of the parent organism feature mutations and a variety of characteristics, their phenotypes, which are then being selected according to their fitness to the constellation of environmental conditions and available resources. The innovation in the sense of genetic variation is being implied on the organism in the form of its genotype, determining its phenotype which is then put to the test of nature. The organism, according to Darwinist evolution theories, has no active influence on the combination of characteristics it features, and nature determines its survivability. The natural selection mechanism leaves only a passive role for the selected organism, upon which the decision for survival or extinction is being implied. The innovations, the innovators and the population being exposed to selection are all one and the same. However, this logic can describe social and economic evolution as long as the focus of analysis is being turned onto groups, organizations, firms, institutions and industries as the entities, and their populations as those which go through selection. Semantically, economic evolution theorists, especially of the institutionalist stream, tend to relate to "innovative firms" or "institutions".

However, when relating to innovation and innovation management, it becomes obvious from the literature, that it is not the firms or institutions which are, or could ever be, innovative. Innovativeness is an attribute of agents, "champions", individuals or groups of individuals. And it is also these individuals who feature incentives, interests and motivations. On the other hand, the innovative individuals are not the entities being selected.

The notion of selection itself has different characteristics in the biological and economic and social contexts. In nature, selection has a quite deterministic sense. Phenotypes which do not fit are due to perish. In social systems, institutional concepts which prove to be inferior might disappear, organizations dissolve, technologies be abandoned and firms close. But in most cases we can assume with relatively much confidence; nobody would die. Agents building groups, firms, industries and institutions, are very likely to adapt themselves to a new pattern, adopt new ideas or technologies and continue their activity in another organizational constellation. The selection in organizations' populations is nothing else but a rational decision internal

[2]Due to the limited control of human beings over processes they conduct, there is always a residual mistake existing in any process; a portion of the process being determined by "nature". Deviation of the process achieved results from the process intended results is an innovation that can thereafter be adopted. Such unplanned achievements are the source of a big part of the innovations of the pharmaceutical industry, where medications tested for one effect often appear to have an additional unplanned but useful effect.

to the organization itself, as emphasized in the previous section 13.

The principle identity between the phenotypes as interactors, the genotypes as replicators and the selected entities, which is inevitable for biological evolution, does not apply to socio-economic evolution processes. This is a cause for a substantial discontinuance in the explanatory context of the economic evolution. A reductionist analysis of individual agents as the basic – atomic – unit of social constructs, and the application of social and psychological recognitions about the innovative behavior of agents needs to be kept separate from the evolutionary ecologic perspective of organizations populations. The continuance prevailing in life sciences, all along the conceptual line drawn from the physical and chemical forces determining molecular genetic processes up to the level of population ecology systems, cannot be applied directly to the logic of economic evolution.

15.2. Memes and their Limits

The term meme has been coined as by Richard Dawkins in his book "The Selfish Gene" [Dawkins, 1989] of the year 1976 which, although intended to be a book about genetics, laid the ground for the science of memetics. According to Dawkins, memes are a new kind of replicators[3] [Blackmore, 2001]. The most familiar replicator is the gene. Dawkins created an abstract analogue of genes and organisms in the form of replicators and the vehicles carrying them. In chapter 11 of that book he then developed the abstract notion memes as a unit of cultural transmission analogous to the gene. Memes and genes are different kinds of replicators in the sense that only genes consist of material, chemical molecules. These molecules, the DNA, contain information in the form of strings of nucleotides, the basic units of DNA, each consisting of one of the four bases – adenine, cytosine, guanine and thymine – linked to a sugar molecule. The information stored in the the DNA is nothing more than a code consisting of these four "digits". Memes denote a rather abstract form of information, which is not (necessarily) featured in a material form. What genes and memes share is the capacity to replicate themselves. In their environments, memes like genes are due to compete with other variations of replicators of their own kind and go through selection according to their goodness. Analogue to genes, memes also go through variation and mutations during the process of replication.

Memes influence their surroundings and create the surrounding conditions for the interpretation of new "arriving" memes introduced into their environment by transfer. The design of the transfered meme is being altered through the receiving surroundings. The meme that starts it journey in one surrounding in a certain design, is not only going through a process of selection in the new environment, but already at its arrival it is being interpreted according to the population of memes already "residing" the receiving (and perceiving) environment, and adapted to the construct they have already created. The design of the meme in the new environment is therefor likely to differ from the design it had, and its role in the new

[3]The term "replicators" has been also coined by Dawkins in this very same book.

environment would probably alter from that it had in the old environment. We can therefore say, that memes are not only exposed to selection, but also to mutation already during the process of transfer. Moreover, mutations of memes do not only occur as result of replication mistakes (such as phonetic misunderstandings), but as of an active adaptation conducted by the population of memes in the receiving environment. Nevertheless, memes also adapt their receiving environment already at the moment of arrival. The causal agency of memes, being able to directly influence, and be influenced by, their surroundings, the memome, is not an attribute common also to genes. Genes cannot independently and directly alter the genome in which they exist. They are rather depending on their expression as a phenotype of their interactor and are therefore being selected indirectly. The interaction between genes, their environment and other genes, is intermediated by the interactors.

Dawkins's concept of memes is a unit of information residing in the brain and is the mutating replicator in human cultural evolution. As recognized by Dawkins, cultural transmission is not unique to man. Except for the example mentioned by Dawkins, of the existing dialect groups within the population of birds called saddleback and living in New Zealand, we know that other species transfer knowledge, skills, methods and routines in the form of non genetical information. However, as Dawkins writes, *"it is our own species that really shows what cultural evolution can do"* [Dawkins, 1989]. According to Dawkins, if memes are the new replicating entities, the basis of an evolutionary process of differential survival of replicating entities, the human culture is the new primeval soup.

According to Dawkins, if there are replicating entities, they will almost inevitable tend to become the basis for an evolutionary process. The replicating trait is the fundament and the constitution of these entities, as their suggested denomination "replicators" comprises. Dawkins [Dawkins, 1989][4] does not try to explain or justify this drive to replicate, as he writes:

> "Throughout this book, I have emphasized that we must not think of genes as conscious, purposeful agents. Blind natural selection, however, makes them behave rather as if they were purposeful, and it has been convenient, as a shorthand, to refer to genes in the language of purpose. For example, when we say 'genes are trying to increase their numbers in future gene pools', what we really mean is 'those genes that behave in such a way as to increase their numbers in gene pools tend to be the genes whose effects we see in the world'. Just as we have found it convenient to think of genes as active agents, working purposefully for their own survival, perhaps it might be convenient to think of memes in the same way. In neither case must we get mystical about it."

The remaining question is, what is the driving force behind the replication of replicators? Why would the first replicating molecules, created perhaps through spontaneous chemical processes in the primeval soup, inevitably feature the will and the drive to replicate? Just because they can do so? There is no motivation of DNA

[4]Refer to page 196 in [Dawkins, 1989].

Molecules to replicate. Or is there? After all, even the urge of the vehicle – the organism – to survive is genetically conditioned. At any case, Susan Blackmore's notion [Blackmore, 2001], merely attributing a passive role of a *"selective imitation device"* to the human brain, does not seem to be a satisfying solution. It seems much more, that the driving power behind replication lies in the selecting environment, rather than within the replicators themselves. It could be the power of nature, to be more concrete, of physics and chemistry, driving these molecules in a Brownian random and – at the same time – ordered motion, copying them through spontaneous reactions, and selecting the fittest of those only to variate on them and replicate them again. But can this driving force really be just a chemo-physical force; a huge process of the universe transferring from one to a lower potential energy level, increasing stability of the system? The answer for this question would deliver the answer for life itself and its purpose.

An analogue force can be applied to the case of memes. The force driving the creation and variation of memes exists nowhere else but in their environment, the human mind. The selecting environment evaluates memes and determines whether they are going to spread further, creates new ideas out of the primeval soup and puts them to the test of selection. maybe this force is actually the so called human spirit. But the main question remains open; what is the purpose behind the human spirit? Is it possible, that this force called the human spirit is just a meta process of this universal process of moving towards a lower energetic level? Is it just a mean to serve that very purpose through increasing the probability of survival of the genes? Can memes go through the process of their own evolution just because their vehicles try to increase the survival of its own genes? Or is there a separate force driving the survival of memes? Memes should be differentiated from ideas. Derived by Dawkins [Dawkins, 1989] from the Greek word *mimema* for "that which is being imitated", memes can be nothing more than pieces of information. Only when submitted to the force of the human spirit, the force giving them the drive and the cause to be created and spread, memes turn to have the power of life and together with it they become ideas.

Let us assume, that the only urge motivating the human spirit is the urge to survive. That implies, that all the mind-power deployed by human beings is just motivated by our hope to crack the code of life and the universe, which would enable them to achieve immortality. If that is the case, then what the human mind is only out for is just to recognize superior memes and spread them in order to help the species to advance towards immortality. It is not very difficult to imagine, considering the fact that any religion I can think of suggests some kind of a concept – a short-cut – to some form of immortality. And in most cases, the key to immortality is the absolute acceptance of this very religion by all human beings; a concept whose impossibility serves as the ultimate and recursive explanation for mortality itself. If the purpose of evolution of memes is the human being reaching immortality, then the human being, the vehicle of memes, "wants" to pass these on in order to promote survival. That could also be the explanation why the human race is the only one possessing and developing a memome; it is probably the only race that grasped its

own mortality and should therefore try to prevent it.

Paradoxal, however, is that mortality itself is one of the driving forces of genetic (if not that of memetic) evolution. A fundamental part of evolution is an optimal mortality rate and an optimal life expectancy. Without mortality, there would be no selection and no (Darwinian) evolution. So if this hypothetical purpose is due to be achieved and the secret for life is about to be revealed, then all evolutions, genetic, memetic and whichever interdependent evolutions that additionally exist, are all going to seize.

15.3. Selection of Ideas

Facing the problematic in the application of biological ecology principles into social and economical analysis, a certain modification of the social economic evolution is needed. The individualistic and reductionist approaches might gain on validity, if economists seize to search for the analogues of DNA and biochemical mechanisms of mutation at the base of economic and social change. A further step of abstraction might be needed, in order to release economic evolution, as analogy to biology, from the restrains of its own not yet determined validity. Economic evolution does not necessarily need to wait for the final decision of the dispute over the role of biology in psychology and sociology, in order to continue its journey into logical empirical analysis, investigation and deeper insights into social economic processes themselves. For a better abstractability, it could be more appropriate to turn the focus of analysis from the actors in a social system to the mere ideas they possess.

Ideas, let it be routines, patterns[5], information or knowledge, do not seize to exist as a consequence of economical, social or institutional selection they are exposed to. It is indeed the ideas, though, which are actually being selected. However, instead of taking the role of selected entities in the ecological system, the entities making choices between different ideas – and by that selecting them – are to a greater extent part of the selecting environment itself. The selecting entities take decisions and make choices between ideas. They decide whether to adopt an idea or reject it, and further on, according to the character of the idea's contents and the constellation of conditions, they are the ones choosing weather, how and under what circumstances to implement it. The selecting entities will be further on related to as the possessors and/or implementors of ideas.

The evolutionary fitness of ideas in the Darwinist evolutionary sense, is expressed through their distribution and their dominance in their environment. Just like a natural environment, the diffusion environment of ideas can feature borders and contain niches, in the form of and in accordance to communicational connections between social groups and systems. The environmental borders can be both in the dimensions of space and time. The processes of reproduction of ideas take place through adoption, learning and imitation by new possessors, on the market or in

[5]For the sake of abstraction, also cooperation, grouping or any organizational or institutional structuring can be considered as a pattern of conduct

the system. The decision of the possessors to implement these ideas is the actual selection of ideas. The suppression of ideas through other ideas takes place in the process of diffusion, while possessors choose to adopt some ideas over the others and implement these. As mentioned before, suppressed ideas do not inevitably need to perish or disappear. Just like in nature, where "undeveloped" life forms continue to exist in the same environment along with highly developed life forms.

Consider a simple system in which a given routine A is the only routine known at the point of time t_0 to achieve a certain purpose. At a point of time t_1, a second routine B is being introduced. The bigger the relative share of possessors preferring to implement routine B over A, the more (evolutionary) successful we can consider B. Routine A may continue to exist in the form of information. According to documentation possibilities (which are as well part of the complex of environmental conditions faced by the ideas) they can continue to exist and remain recallable long after their possessors have perished. But its prevalence as the chosen means to achieve a purpose declines over time[6]. In the evolutionary sense we may consider routine A as suppressed by routine B, the reproductive successfulness of routine B as superior and the niche – the system – as dominated by it. Routine B is then obviously fitter than A.

This perspective on the ideas themselves as species and populations, is altering from the perspective dominating evolutionary economic literature. Its advantage lies in its capability of abstraction of reproduction and selection processes and simplifying their applicability to social and economic evolution analysis purposes.

Assigning an attribute of a conscious entity and an urge of survival to ideas, or memes, as conceived by Dawkins [Dawkins, 1989], we can also suggest a decision scheme for the strategical struggle for survival of ideas. The meme would, according to this scheme, direct its actions according to rational estimations of its probability to survive in one or the other environmental constellation. Additionally, choosing between environments, the memes would also need to decide whether it should let itself be adapted to the constellation of other memes in the chosen environment, or better adapt the chosen environment to fit itself? The bidymentional decision scheme of "going where – doing what" will be developed in detail in the following chapter 17.

Although not preventing the further examination of organization populations in markets and industries, the concept of selection of ideas additionally enables an examination of the fitness of organizations from an individualistic – the members' – perspective. The only adaptation needed for that purpose is the observation of the organization itself as an abstract idea, and the decision of the individual whether to become or remain member in the organization, as the mere process of reproduction

[6] Certainly, even the purposes chosen to be achieved are just as much part of the "population" of ideas exposed to selection as the routines serving to achieve them. For example, the technological knowledge of mummification methods, possessed by ancient Egyptians, has disappeared together with its possessors. Due to lacking documentation of these techniques, and to irrelevance of the purpose of body conservation for the succeeding civilizations, both the means and the purpose have been forgotten over time. The methods of mummification have only been reconstructed to a certain extent after intensive scientific research.

and selection of that idea. According to this logic, an organization which attracts new members is evolutionary fitter than an organization that does not manage to do that or even loses members. The absolute size of the organization has therefore only a secondary significance for its assessment. Much more significant for the evaluation of the organization's performance is the first and second reductions of the organizational size[7] function over time. The first reduction delivers the information about the trend and intensity of change in group size, the second derivation delivering the change in that absolute growth. An implication of this concept for the representative case of co-operatives, as an example for organization form of humans co-operating for a common cause, will be the main subject of part IV of this work.

[7] In the sense of the number of members.

CHAPTER

SIXTEEN

THE CO-OPERATIVE ECOLOGIC NICHE AND THE PROCESS OF OSMOSIS

The co-operative, as mentioned often in the literature and in this book, is a voluntary grouping of individuals. The group membership is a consequence of a free choice of each of the group's members. A fundamental prerequisite for making that choice and conducting that act of being or becoming a member, is the mere information considering the available option of membership. In that sense, the co-operative and the membership are ideas – memes – prone to be selected. These ideas spread in a diffusion process through the population of actors. This population can be also regarded to as the market for co-operative membership. During this diffusion process, the idea of membership is being selected by the actors according to their interests, preferences and needs. The combined distribution of these through the population of actors, could be understood as what is usually referred to as market structure. This structure not only constallates the market for the "product" named co-operative membership, but also at the same time characterizes the environmental conditions, through which the idea of membership is due to be selected.

In the evolutionary sense, and following the notion of chapter 15, the idea of membership is being selected according to its fitness in the aforementioned environmental conditions constellation. The fitness of the idea – its goodness – is measured by its ability to serve the interests of any given actor in a way superior to the option, and the idea, of not implementing it. In simple words, the idea of membership must prove itself superior to the other alternatives. The fitness of the idea is therefore a relative value, measured in relation to its competing ideas.

Due to the special character of the membership idea, being the idea of joining a group – the group of co-operative members for that matter[1] – the limits of its diffusion determine at the same time the borders of the group. The group of actors who implement the idea of membership and create the environmental niche, for whom the idea of membership proves to be superiorly fit is well defined and easily observable.

[1] Of course, this notion is applicable to any definable group with determinable borders other than co-operative groups, which serve here as the direct application.

That well observable niche is therefore, by definition, the niche of specialization of the membership idea. In that particular niche is the membership the evolutionary superior idea.

The individual actor, playing the role of the selecting environment and choosing whether to adopt the idea of membership and implement it, is at the same time determining his or her own inclusion into or exclusion from the group, and at the same time determining its position inside or outside the expertization niche of that idea.

Consider the market as an environment, consisting of a two dimensional space in which a large limited number of actors are freely moving. The idea active in this environment is defined merely by its own borders. Those actors constructing the environment, who chose to implement the idea are considered to be within its borders, and those who decide not to implement the idea are outside. Mind that for the purpose of this illustration we are not interested in any characteristic of that idea rather than merely its capacity to include actors from the environment into the subspace, which is the space included within its borders. Let us imagine the border as a closed line, determining who of the actors moving in the environment is included within and who is outside that line. The actors constructing the environment can therefore cross the line and move in and out of the space or move the line itself to include or exclude themselves from the subspace of the idea. The idea's capacity to include actors into its subspace can be expressed by the surface included within its borders, and the surface which each actor is consuming. Since there is a maximal density of actors within the subspace, the force that each additional actor would need to apply in order to press itself into the subspace is going to increase over proportionally. That would also apply, if we introduce a certain elasticity to the line surrounding the subspace, to the actors themselves or to both.

This characteristic of limited capacity of the niche to contain members is distinctive for social groups in general and to co-operative groups in particular. The mechanisms responsible for this limitation are discussed in detail in chapter 21 through the notion of limited value of membership and the deterioration of this value with the growth of the group. The general principle illustrated here is analogue to biophysical osmosis. The borders of the niche create the analogue to the semi-permeable membrane. The adopted idea of being included in the group is analogue to the solute within the membrane and the actors moving into the group act analogue to the solvent inside and outside the membrane. The solution which is emerging from the movement of actors into the circle of idea-adopters loses its potential as it is being thinned and the potential gradient between inside and outside the circle declines along this process. The osmotic potential is a result of the positive advantage of membership over an alternative as illustrated in detail in chapter 21. The limitation to the capacity of the group to contain members follows the principle of osmotic pressure.

In the innovation theory, the common metaphor to describe the process of innovations distribution is the diffusion. In the natural sciences, diffusion describes a process in which solutes spread through volumes of solvents through the Brown-

ian motion. For our case that analogy would demand the definition of the idea as the analogue for the solute, spreading through the solvent environment of selective minds. The notion of evolution developed in the preceding chapter 15, demands an adjustment to that analogy. For our case, a distinctive border is separating between the environments within and outside the group. The environment within the group contains the population of actors choosing to adopt the idea of membership. By doing that they are virtually moving through the barrier, analogue to the semi-permeable membrane, and reduce the osmotic potential of the membership idea. Accordingly, we are actually imagining an additional process to the diffusion of ideas (or innovations as a specific case), a process which is perhaps unique to the type of ideas which contain the element of belonging to a distinguishable group of idea-adopters: The process called osmosis of ideas.

CHAPTER

SEVENTEEN

EXIT, VOICE OR ACQUIESCE AS EVOLUTIONARY STRATEGY

Evolution, whether by selection or adaptation, implicates the existence of a goal. The goal common to all evolving entities is the increase in survival probability through the increase of fitness. Fitness is specific to the evolving entity just as much as for the interacting environment. A deer might benefit from high fleetness when escaping a bear attack. Through its fleetness, the result of a long ancestral period of selection for this attribute, the deer would have lower probability of death from bear attack in an environment populated by bears. The bears in this case are a feature of the environment to which the deers are adapted. However, parallel to the selection of deers, the population of bears is going through a process of selection as well. Fleet bears are more likely to feed and less likely to be selected out by starvation. Fleet deers are the environment to which the bears need to adapt, just as much as the opposite. But will the attribute of selection, the fleetness of the animals, increase unendingly? Indeed, that could be the case. However, the rational strategy for both sides, the hunter and the prey, would be to introduce a new attribute – an innovation – to the system. Such a strategy could be the introduction of endurance, determining which of the animals would be the last to give up the chase, the deer running for its life or the bear chasing its prey. Or it could be the ability to climb trees, in order to escape a predator and in order to chase a prey, as the case may be. Such an innovation would enable more efficient means for tackling an environmental challenge than simply increasing one ability such as fleetness. It becomes obvious that both animals are at the same time the cause and the artifact of the evolutionary process of the system they build.

The evolution itself serves as means for a goal. The goal of natural evolution is the survival of the individual organisms, implying the survival of the species. Darwin's theory of natural evolution relies on the causal explanation of spontaneous mutation and environmental selection of attributes. Here, survival strategies are much more the result of selection than the means of increasing survivability. A spontaneous mutation would provide a fleeter deer, making the rest of the deers – the relatively slower ones – more likely to be hunted, enabling the faster ones to prosper in the

given environment. The strategies of coping with the environment can be detected from the natural attributes of organisms and interpreted utilizing a logical conclusion of causality. The observer builds the scheme of how certain attributes serve for the survivability of a certain organism in a certain complex of environmental conditions. For our exemplary case, the observation of fleet deers is logically explained as a result of out selection of the slower ones by bear attacks, and the fleetness of the deers is explained as the attribute adapting them to their bear populated environment. The attribute of fleetness is a result of a spontaneous process, which is no contradiction to its being a survival strategy of the dears, in spite of its spontaneous occurrence. Social evolution is, by contrast, a result of decision series – strategic decisions, nota bene – of individual interactors. The strategies chosen serve other purposes rather than mere survival of the deciding interactor, which as a matter of course increases the complexity of the interaction system. The survivability of the strategy itself, the idea, is a result of its utilities for the decision maker, but not necessarily the reason for the idea per se.

Whether the reason or the result of evolution, strategies in both natural and social systems can all be equally classified into the same fundamental categories. The first dimension of classification, two major strategy classes are to be considered:

- Adaptation to the niche. This class features the group of all strategies serving for the actor to adapt its competencies to the conditions of its immediate environment. This category implies adapting of behaviors and activities of the interactor to the given resources and the limiting and stressing factors. It also includes all means of recognizing and exploiting opportunities in the given environment.

- Adaptation of the niche. This class features the group of all strategies serving for the actor to adapt its immediate environment to its own competencies and needs. This category implies behaviors and activities of the interactor aimed at changing the given resources, their availability, and the limiting stressing factors, in order to adapt these to its own competencies.

The second dimension of classification is the qualification specification to location:

- Specific niche specialization, in adapting to the niche as well as in adapting the niche itself, is likely to inhibit migration between niches.

- Trans niche qualification, in adapting to the niche as well as adapting the niche itself, is likely to disburden migration between niches to fit competencies.

The higher the niche-specification of qualification, the lower is the probability of niche-exit as the rational strategical solution. The specification of qualification noted as the first dimension of classification, can apply to the capability to adapt oneself just as much as to the capability to adapt the niche to the own needs. Therefore, the range of niches that the actor can adapt, or adapt itself to, could influence the choice between strategies of the two former categories and a strategy of the third category, the migrational strategy.

	Qualification Specification	
	Specific Niche Specialization	Trans Niche Qualification
Adaptation	acquiesce ; expertise	acquiesce ; exit
	voice ; expertise	voice ; exit

Table 17.1.: Decision Dimensions of Evolutionary Strategies

As can be seen from this notion, strategies of the first two categories can be deployed in combination with strategies from the third. Analogue we can present the process of decision as the determination of a combination of strategies of the two dimensions of classification defined before. A simplified formulation of the process ensues through the formulation and solution of the two simplified questions:

- Go where? Options: Expertize on a given niche, or switch to another niche to fit competencies (Exit).

- Do what? Options: Adapt niche (Voice), or adapt competencies (Acquiesce).

The answers accord to the interactors (estimated) qualification and can be formulated as the combinations illustrated in table 17.1.

To demonstrate this notion, let us consider a hypothetical situation. A farmer is cultivating a field of corn on a hill next to a river. Just as the corn is about to ripe, the farmer notices a family of wild hogs feeding from his field. In addition to several other, the farmer considers several feasible solutions: He may just accept the damages caused by the hogs and keep cultivation the field like before, carrying the damages of declined yields. By that tactic, our farmer chooses to insist on his field (expertise on his niche) and tolerate the change in conditions (acquiesce). Alternatively, the farmer may build a fence around his field to keep the hogs away. By that he chooses to insist on maintaining his field (expertise on niche) and adapt his resources to the given situation (adapt niche). Let us imagine, however, that the farmer observes a feasible alternative to establish a new field on the other – flatter – side of the river. He might need to tolerate more often flooding of his field in the lower terrain, but he escapes the threat of the hogs to another area, where they have not arrived yet (exit and acquiesce). Otherwise, the farmer may choose to move to cultivate a new field on the other side of the river and use the flat terrain on the new site to dig a water duct around his field to keep the hogs, and maybe even floods, away (exit and adapt new niche). Whether combination the farmer would choose is depending on his qualifications in either building fences or digging aqueducts, and on the costs and gains (in form of prevented damage) each one of the options is likely to yield.

The difficulty involved in the decision is the complexity of the given alternatives. The interactor needs to simultaneously compare between the estimated consequences of three options according to its own given qualifications. Especially difficult is conducting such a decision under the situation of an aversive event. In order to accelerate the decision process under such a situation, in particularly under a life threat,

the organic brain features a rather automated reaction, which is the activation of the parasympathetic nerve system. This mechanism will be the subject of section 18 to follow.

CHAPTER

EIGHTEEN

EXIT, VOICE OR ACQUIESCE AS A FIGHT, FLIGHT OR COPE REACTION

The fight or flight behavior is the denomination for a syndrome of reactions demonstrated by animals and humans in the face of aversive events. It is regarded to as the prototypic human response to stress. First investigated by Walter Cannon [Cannon, 1915], as a result of his interest in traumatic shock reactions of soldiers during the first world war, fight or flight describes the physiological neurobiological response of animals to physical threat . The physiological respond described by Cannon, involves the activation of the sympathetic nervous system, that innervates the adrenal medulla, producing a hormonal cascade that results in the secretion of catecholamines, especially norepinephrine and epinephrine (adrenaline), into the bloodstream [Taylor *et al.*, 2000]. These hormones accelerate the heart and lung activity, and inhibits energy consuming and for the immediate survival less crucial activity of the stomach and upper intestinal system, slowing or stopping digestion. Further effects are the constriction of the blood vessels in many parts of the body with simultaneous dilation of blood vessels for the muscles and deliberation of nutrients for muscular activity, auditory exclusion, loss of peripheral vision and several other physiological effects regulating the resources of the body to facilitate urgent physical violent activity. Deakin and Graef [Deakin J. F. William, 1991] defined aversive stimuli as such that motivate avoidance behavior. This definition encompasses negative incentives and re enforcers and much of what passes under vaguer terms such as *"punisher"* and *"stress"* [Deakin J. F. William, 1991]. Whether the human or the animal fights or flees in response to sympathetic arousal depends on the nature of the stressor. If the organism estimates a stressor or predator as likely to be overcome without severe damages to itself, the organism is more likely to attack. In case of immense danger, flight is more likely to be the chosen tactic.

An appropriate and modulated stress response is the core of survival. An organism whose response to stress was successful is more likely to pass that response on to subsequent generations. The correct estimation of the stressor and the choice of the correct response, resulting in the highest likelihood for survival, increases the likelihood of inheritance of the correct response itself, making the fight or flight an

evolved response [Taylor *et al.*, 2000].

Flight itself can take several different forms. In addition to physical distancing from a source of stress, flight can also take a sensory form. A cammelion might change its color to camouflage itself and appear "not to be there", other species, such as deers, might stand still in hope not to be noticed, and further others, such as several species of beetles, might even play dead in hope that the attacker would loose interest.

Activation of the sympathetic nervous system is recognized to occur in reaction to any form of stress, including attacks by predators, assaults by members of the same species or other dangerous conditions such as fire, floods, earthquake or storm [Taylor *et al.*, 2000]. However, in addition to physical threats, and especially in social systems, stress can also originate in communication and interactions within the social system itself. Such aversive stimuli trigger the activation of the sympathetic nervous system. The appropriate reaction, however, cannot feature the simplified scheme of fighting or fleeing the stressor. Especially in modern times, human reaction to stress can be manifested in further forms, additional to actual fighting or fleeing behaviors. Fighting can be manifested in angry, argumentative behavior. In the social context, flight response can be manifested in social withdrawal, television viewing or surfing the Internet. All responses, however, are triggered by the sympathetic nervous system. Since in the social constellation, no actual physical fight or flight reactions are available options for confronting aversive events, long lasting states of stress are often created. Due to the immense distortion of the hormonal balance through the response to aversive stimulus, an enduring stress (real or just conceived) creates a massive disturbance of the organic function.

Alternative reactions to fight or flight are provided by a variety of behavioral reactions, all designed to deliver solutions for coping with an aversive stimulus. Taylor et. al. [Taylor *et al.*, 2000] analyzed generic differences in the choice of behaviors under stress. according to Taylor et. al. [Taylor *et al.*, 2000], the decision whether to fight or to flee as a response to sympathetic arousal is not only depending on the nature of the stressor, as thought before. A further special differentiation in the reaction appear between different genders of the species. Although stress response does not seem to vary substantially between human males and females in its neuroendocrine core; both seem to feature similar hormonal processes of activation. Females, however, appear to feature neuroendocrine mechanisms inhibiting fight or flight behaviors and facilitating alternative – tending – behaviors, mainly aimed at protecting offspring, retrieving them from threatening circumstances, calming them down and protecting them from further threat [Taylor *et al.*, 2000]. Additional to tending behaviors, females demonstrate stronger tendency to bond with other – especially other female – organisms, in order to cooperate, support and by that reduce threats and increase likelihood of offspring survival [Taylor *et al.*, 2000]. Tend and be-friend is a specific strategy choice featuring an alternative to technical fight or flight behaviors. According to the demands introduced by the survival conditions and the organism's cognitive capabilities, other strategies can be chosen. Zooplankton in the waters, for instance, does not feature the capability to fight nor to flee a

predator. The chosen strategy of survival of such organisms is massive multiplication that should compensate the high rate of mortality. The complex of strategies of superior organisms, to actively protect the offspring, is a part of a strategy complex containing the choice to protect the small amount of offspring on one hand, together with the strategy of keeping the number of offspring in such dimensions, that can be protected in the first place, on the other hand. It is therefore not easy to point at the cause and the result of the strategy complex evolution. Was the cognitive ability to make decisions the initial condition for reducing the number of offspring to amounts that can be protected? Or was this cognitive ability a result of the necessity to protect the small and precious number of offspring in order to secure survival?

The notion, featured through the metaphor of fight or flight mechanisms, has suggested that neuroendocrine mechanisms are activated as an immediate response to stress in order to facilitate appropriate decision making – the choice of survival-efficient behaviors – under urgent situations. However, as new evidences of neurobiological research show, the mere situation of making decisions, or merely needing to make decisions, involves the activation of the unconscious, as well as the conscious areas of the brain. It is therefore to expect, that decision making itself is a process conducted in areas of the brain related to those acting under stress, therefore activating signals being interpreted by the organ as under-stress activity. In the physiological perspective, a situation of decision making is for itself being interpreted as a stress situation, initiating stress alert in the organism.

It is easy to recognize the correspondence of fight, flight or freeze rationale of choice to the categorization of strategies suggested in the former chapter 17. Both characteristic decision situations commonly feature the basic elements of strategic decision situations:

- Aversive event or situation.
- Alternative strategies to be chosen from.
- Strategy classification according to the two classification dimensions formulated in the former chapter 17.

It could therefore be claimed that both “Fight, Flight or Cope” and “Exit, Voice or Acquiesce” are special cases of the general strategy configuration of the two classification dimensions; choice of location, adapting the location or adapting to the location. In the following part IV of this book, the rational logic of exit, voice or acquiesce strategies is going to be implied to the case of co-operative membership. The individual member’s response to an aversive situation is going to be analysed according to the detailed formulation of the costs and benefits of each of the three strategic options.

Part IV.

Exit, Voice and the Growth of Co-operatives

CHAPTER

NINETEEN

INTRODUCTION TO PART IV

In this part of the book I intend to attempt what Albert Einstein would probably call a thought experiment [Isaacson, 2007]. As a thought experiment it provides information that does not come from the reporting of new empirical data. My intention is to make use of well established experimental findings in order to determine a launch point for a deductive theory. The theory itself does not contain a description of the empirical patterns underlying it. Much more it is attempting to illustrate a human phenomenon and to find its evidence and its explanation within the illustration itself.

The imaginative visualized scenario underlying the introduced theory, is the situation in which a member of a growing group is considering the individual consequences of the group's development and the available options of action. The extrinsic and intrinsic incentives for group membership and their dependency on the structural size of the social group are well investigated. Integrating these into one system of arguments will enable us to understand the characteristic of social group growth. The subject of the experiment is the simple social construct and management form epitomized in the cooperative organization.

The first step of the following experiment is the introduction to the general paradox of organization growth and declining cohesion of the co-operative group. The second step is the formulation of the limited value of membership for the individual member, formulating the functional connection between the size of the group and the utility drawn by the member. The third step is the formulation of the strategic choices the individual member confronts at the point at which his or her utility from membership is no longer positive. This step will also demonstrate the influence of the group-size on the outcome of the rational choice between exit, voice or acquiesce, showing that the tendency of the individual member to leave the group rises with the growth of the group. That is perhaps a formal explanation for the known notion of decreasing group cohesion as a result of membership structure. At the fourth step we shall leave the level of the individual member and turn to analyze the influence of the individual members' behavior on the structure of the group. This step will formulate the dynamic relation between the growth of the group due

to entrance of new members and the resulting behavior of the members, causing in its turn the retardation of the growth itself and bringing the size of the group to a state of dynamic equilibrium. The fifth and last step turns the focus from the level of the single organization to the level of organizations population in their market environment. This step demonstrates the positive effect of the organization at state of dynamic equilibrium in its environmental niche, the market system. These five steps are intended for creating the multilevel perspective, attempting to cover the complete spectrum of ecological interdependencies between the individual member, the organization and the market environment.

CHAPTER

TWENTY

THE CONTRADICTING FORCES SHAPING THE COOPERATIVE GROUP'S SIZE

The cooperative is by its nature, not only a form of governance, but also a group of individuals, who join their forces in order to fulfill a common economical purpose. By serving a common cause, the members of the group also fulfill a series of personal - non economical - needs. While serving the cause of maintaining competitiveness, increasing the size of the group has a negative influence on the perception of the group by the individual member. The later has a negative effect on the performance of the group itself.

The number of members in cooperation has been considered to have a great significance for the analysis of cooperatives. The cooperatives' ability to attract new members, as reflecting through the number of members (size) in the group, has been used in earlier analyses of cooperatives as an important measure for their performance and success. The bigger the group the more successful is the cooperative considered to be [Ringle, 1989][1]. However, while analyzing the different motivations for co-operative membership, these must be divided into two groups: economical and intrinsic. Whereas a big group has a better chance for economical success, only a relatively small group, in which the individual member has a good perception of his influence and significance in the process of making decisions, can satisfy his intrinsic motivations. Therefore one of the group's characteristics, which are essential for the engagement of new and old members, is a relative small size [Ringle, 1999, Kleer, 1985, Verrucoli, 1985][2]. Although each one of these two contradicting interests has been mentioned in the literature before, the effect of this contradiction itself on the size of the group seems to have been ignored.

These two interests also denote that the size of the group is not only a result of its success and of the grade of its members' satisfaction, but reciprocally, the satisfaction of the members is also a negatively dependent function of their group's size. A successful group, which manages to keep its members satisfied, would be at-

[1]Refer especially to p. 128 in [Ringle, 1989].

[2]Refer especially to p. 4 in [Ringle, 1999], p. 363 in [Kleer, 1985], and to p. 391 in [Verrucoli, 1985].

tractive for new potential members and would therefore keep growing. This growth, however, would cause a decrease in the members' grade of satisfaction. How can this contradiction be solved? How do these two forces come to a state of balance?

The aim of this work is to suggest a method for determination and quantification of this balance and the way it is being reached. For that purpose, the size of the group must be treated separately from the size of the co-operative enterprise. The enterprise may and must grow, in order to assure its economical success. The group's size may and - as shown later in this work - can only grow up to a certain limit under a given set-up. This recognition is crucial for a sober formulation of expectations applied to the growth process of a cooperative group and the implementation of its size as a measure for its performance assessment.

CHAPTER

TWENTYONE

THE RATIONALITY AND LIMITED VALUE OF MEMBERSHIP

21.1. The Limited Value of Membership

The following model is designed to delineate a co-operative enterprise purchasing a single homogeneous product from its members, and adding to its value by processing and marketing it. The co-operative is assumed to be acting as price taker on the market. The costs of the enterprise's activity is assumed to be a convex function and the earnings, due to a set price received for the cooperative product on the market, a concave function of the processed quantity. Co-operative members are assumed to judge the desirability of membership on the basis of the incumbent firm's prevailing price, whereas members are price takers in respect to dealing with the cooperative as well as with a competing purchaser [Sexton, 1986b]. Acting according to individual rationality, each agent would remain member in the co-operative group as long as he or she receives at least as much as from acting unilaterally i.e. marketing the product otherwise [Sexton, 1986a, Staatz, 1987, Zeuli & Bentancor, 2005].

Consider a group of G members who join forces to produce $M(G)$ units of a certain co-operative product which they sell on the market for a certain price[1] P . When the demand for production capacity exceeds a critical level, the average total cost will no longer decrease, but rather increase over-proportionally a function of the production quantity M. The progression of the average total costs curve is therefore assumed to feature the classical U-Form [Olson, 1965], applying also to non co-operative enterprises. The co-operative costs and the revenues $W = PM$ are distributed between the members according to their relative portion on the total production quantity of the group, so that the individual total costs of member i are $K_i = (m_i/M) \times K$ and the individual revenues of each member are $W_i = (m_i/M) \times PM$, whereas m_i represents the portion of member i in the total production quantity M of the co-operative and K_i and W_i are respectively the member's shares in the resulting costs and rev-

[1]The market is assumed to be large enough, so that the group is considered as price-taker i.e. the quantity produced does not have an influence on the market-price of its product.

enues. In order that the members take part in the co-operative, there must be a positive utility for each of them [Olson, 1965, Sexton, 1986b, Zeuli & Bentancor, 2005]. $\Pi_i = W_i - K_i \geq 0$ is therefore the gross value of membership for each member i. Moreover, each of the members could market the same product alternatively, either alone or by utilizing the services of another source, having alternative costs Ka_i and achieve alternative profits Πa_i [Sexton, 1986b]. The options for profits which the members face are hence

$$\Pi_i = W_i - K_i = m_i P - (m_i/M)K = m_i(P - K/M) \tag{21.1}$$

or

$$\Pi a_i = m_i P - K a_i \tag{21.2}$$

The quantity m_i that the member would alternatively market is assumed to be the same as his or her share on the cooperative production, and they would sell their product to the same market price. In order that they take part in the co-operative, the profit that they achieve by the membership[2] must be higher than the profit which they could achieve by their own. The condition for membership is therefore

$$\Pi_i - \Pi a_i = m_i(P - K/M) - m_i P + K a_i \geq 0 \tag{21.3}$$

The difference on the left side of the equation we mark as Ψ_i the net value of membership and its positive value is a necessary condition for membership in the group:

$$\Psi_i = K a_i - (m_i/M)K \geq 0 \tag{21.4}$$

Or:

$$K a_i \geq (m_i/M)K \tag{21.5}$$

Thus, it becomes obvious that the member's share in the cooperative production costs must be smaller than the costs which would be caused by the alternative marketing[3]. Assume that the production quantity of the co-operative must be expanded by a unit of quantity for each entrance of an additional member to the group. When the convex cost function begins increasing over $[0, M(G)]$, the condition for membership cannot be guaranteed. We should then expect the net value of membership to become null or negative at some stage for any member[4].

[2] No attempt is done here to quantify the portion of individual non economical motivations' fulfillment in the composition of the total utility the member receives from membership. It is enough to measure the cost, for which the member would exit the group, as an indicator for his or her total utility.

[3] The acquainted reader might recognise the logical correspondence of this disequation to Hamilton's law of kin selection

[4] We assume a heterogeneous group. Otherwise the membership would lose its value for the whole group at one point.

21.2. The Complementary Strategic Options: Exit and Voice

Consider a co-operative of G members is considering the option to accept an additional member. One of the group members disagrees. The group's size has reached its limit for this member; the membership still yields a positive value for the member at this point, but any further growth would cause the exceeding of her price-threshold. Since the member's alternative production costs are about to be exceeded by her share in the cooperative production costs, she now needs to make her strategic choice between "exit" and "voice" [Hirschman, 1970]. The option to exit means that the member could leave the group and produce her product independently. As a result of this choice, the group looses one member, so that the number of members in the group drops shortly to $G-1$. After the member's exit, the group would accept the new member and even up its size back to G. At that point, the group would reach its original size again, which would have justified for the exiting member to remain in the group.

Since there is a positive probability of influencing the group's decision and preventing the new member's entrance, voice would be the rational choice. Moreover, the option to exit is not eliminated by the option to protest. As Zhu, Hendrikse and Krug demonstrated [Zhu *et al.*, 2006], exit not only remains as a last resort, but underpins member's voice making the threat more credible, and can therefore also be used as an instrument of pressure by the protesting member. By choosing the option "voice", the member could raise a protest and by that, try to prevent the further negative development of the group. Among the loyalty of the member to the group and the uncertainty, considering the further negative development of the organization after her - perhaps irreversible - exit, one of the main determinants for the choice of "voice" is how high the member estimates the chances to influence and amend the organization.

In case the member chooses the option "voice" and raises her protest, there is a certain chance for an effective protest, and that the entrance of the new member into the group can be prevented. This chance is depending on the total number of group members and on the relative share of the protesting member in the total production. The size of the group determines the following factors:

- The probability of determining the outcome of a democratic election becomes lower the bigger the group grows[5] [Taylor & Yildirim, 2005, Borck, 2002].
- The costs of voice increase since there is a larger number of persons that need to be reached [Downs, 1957] and
- The probability to influence the group decreases with increasing anonymity in the group and decreasing interaction intensity within it [Butler & USDA, 1988].

[5]Typical to cooperatives is the principle of "one person - one vote".

Therefore, the bigger the group the smaller is the chance to influence it. Indeed, the member's share on the total co-operative production is another determinant for his or her influence on the group. The bigger the relative share of the objecting member i in the total co-operative production, the greater is the influence she has on the group.

However, the relative share of the individual member on the total production also decreases as the group grows. In case the strategy of voice is successful after all, the member succeeds to prevent more new entrances, and holds up the growth of the group for a longer period before she exits[6]. In that case, the protesting member has her aim achieved, she remains a member in the group and the group maintains its size G. If the protest is not effective, the new member is being accepted and the number of members in the group shortly rises to $G + 1$. The unsuccessfully protesting member exits at this point and the number of members drops back to G.

The member that we are observing is facing two alternatives with three possible outcomes. The first alternative is to leave the group and acquire his or her share on production or service from another source and for a price known to this member. The outcome of the choice to exit is certain since the member is either aware of an actual alternative source, or has already included the risk discount factor into the calculation of "his" or "her" alternative costs Ka_i. The choice of voice has two possible outcomes; either the member is able to influence the rest of the group and prevent the entrance of the new member, in which case the group maintains its initial size it had on the beginning of the day, or the new member is being accepted. However, in case the loud protest is not effective, and the group decides to accept the new member in spite of it, the protesting member still maintains his or her option to exit the group. In this case, our observed member whose share on the common production costs has been exceeded would take the rational choice and exit the group for the sake of her - now lower - alternative production costs. Again, the total number of members in the group remains the same as at the beginning of the day.

The situation in which a co-operative group is about to decide whether to accept a new member, an option to which a member in the group objects, is a strategic decision situation for the member. The procession and consequences of that decision for the member and for the group will be considered in the next section.

21.3. An Empirical Model for Exit and Voice Preferences of Individual Group Members

Consider a co-operative member i who draws a net value Ψ_i^G from membership, attained by the difference between her alternative costs for offering her product on the market Ka_i, and her relative share in the co-operative costs Km_i. As the total

[6]The chance for effective protest is also depending on the form of government; a cooperative is assumed to have a free entrance, whereas in a club, the members have more influence on the process of new members' selection and acceptance

co-operative costs is a convex function of the number of members in the group G, this difference is a concave, continuous and twice differentiable function over G such that $\partial^2\Psi_i^G/\partial G^2 < 0$ for all G, and there exists a range $[G_i^*, G_i^{**}]$ of the number of co-operative members so that

$$\begin{cases} \Psi_i^G > 0, & G_i^* \leq G \leq G_i^{**} \\ \Psi_i^G < 0, & otherwise \end{cases} \tag{21.6}$$

Figure 21.1 gives the graphical representation of the relations of these functions.

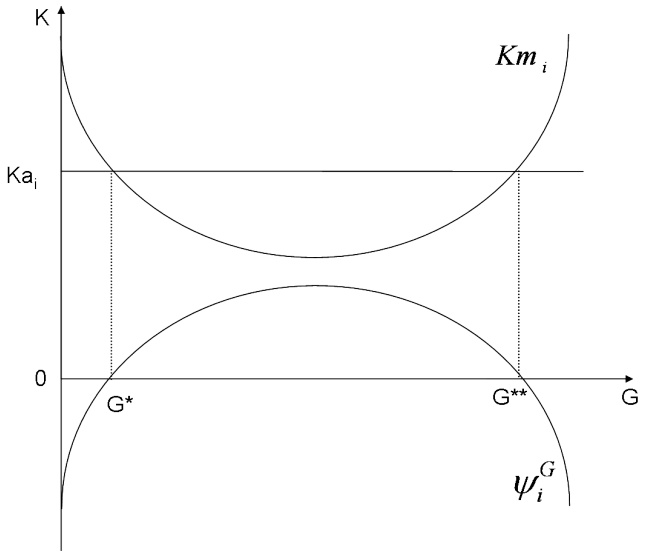

Figure 21.1.: The Relations between the Membership Costs and Utility Functions and the resulting Range of Positive Utility

We now observe the situation in which the group has reached the size G_i^{**} for which $\Psi_i^{G=G^{**}} > 0$. For $G^{**}+1$ the net value of membership would be negative for the observed member i. The observed member has now the choice between three options: exit inducing costs Ce, voice inducing costs Cv, or acquiesce, i.e. accepting the entrance of a new member and taking on a negative value of Ψ_i^G which we mark as the cost Ca. In addition to the direct costs of reorientation and adjustment, the costs of exit include also the risk involved and the loss of intrinsic surplus caused by breaking the member's commitment (or loyalty) to the group and switching to another business partner. Since the commitment to the group is declining as the group grows and anonymity of the individual member rises, Ce is considered as a positive and declining function of G. On the other hand as the group grows, the costs involved in pivoting its decision[7] are rising, so that Cv is a constant rising

[7] We define Cv as the cost for the member to secure that the group decides to refuse the entrance of an additional member to the group.

function of G. Therefore there is a critical size γ_i^* of the group, for which $Cv > Ce$ when $G > \gamma_i^*$, and $Cv < Ce$ when $G < \gamma_i^*$. For member i, the advantage of voice over exit and vice versa pivots at a certain group-size γ_i^*. Figure 21.2 gives the relation between the costs of exit and voice as a function of G.

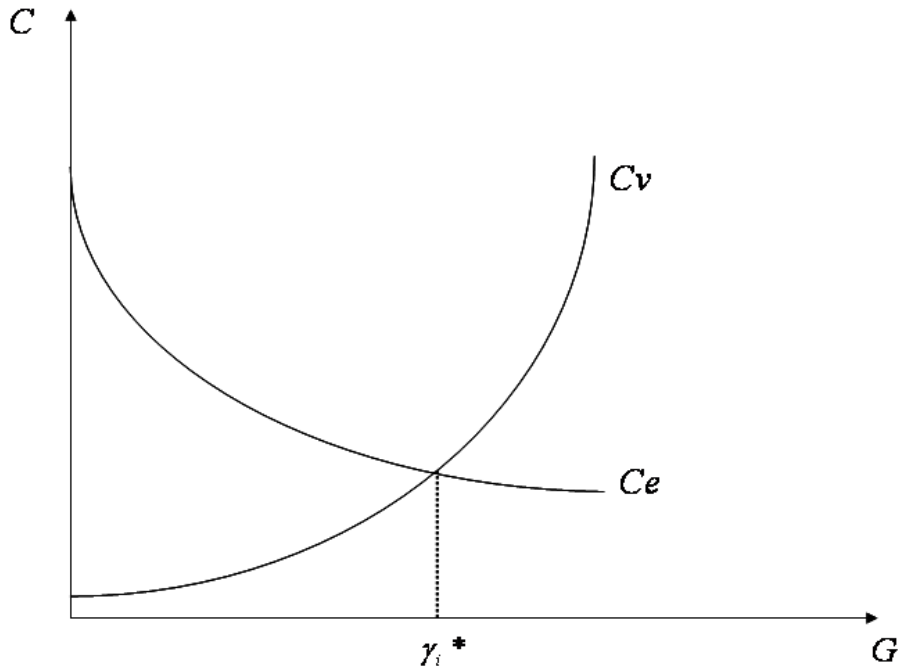

Figure 21.2.: The Relation between the Costs of Exit and Voice as a Function of the Group Size G

At this stage we need to take a closer look at the cost of acquiesce Ca. As defined before, the total cost function of the co-operative enterprise features a convex U-form. We shall now concentrate on the right half of the curve, the range in which the costs are rising as a function of the produced quantity, and therefore as function of the number of members in the group G. Let ∂G_j represent an addition of one member to the group at any point j along the cost function curve. It is easy to see that the resulting rise in the total production costs ∂K_j of the group is growing with the number of group-members G. For a graphical presentation refer to figure 21.3.

Each group member has a point on this curve, at which it accedes "his" or "her" alternative cost Ka which can be located anywhere between the points G^{**} and $G^{**} + 1$. The costs of acquiesce is the actual negative utility from membership when the number of the members in the group has reached $G^{**} + 1$. This negative utility can take any value in the range $\left[0, \Psi^{G^{**}+1} - \Psi^{G^{**}}\right]$. This range however, is a growing function of G due to the convexity of the total cost function. As graphically demonstrated in figure 21.4, the maximal value that the cost of acquiesce can take is a rising function of the number of members G.

Inversely phrased, when the group becomes bigger Ca can become much higher

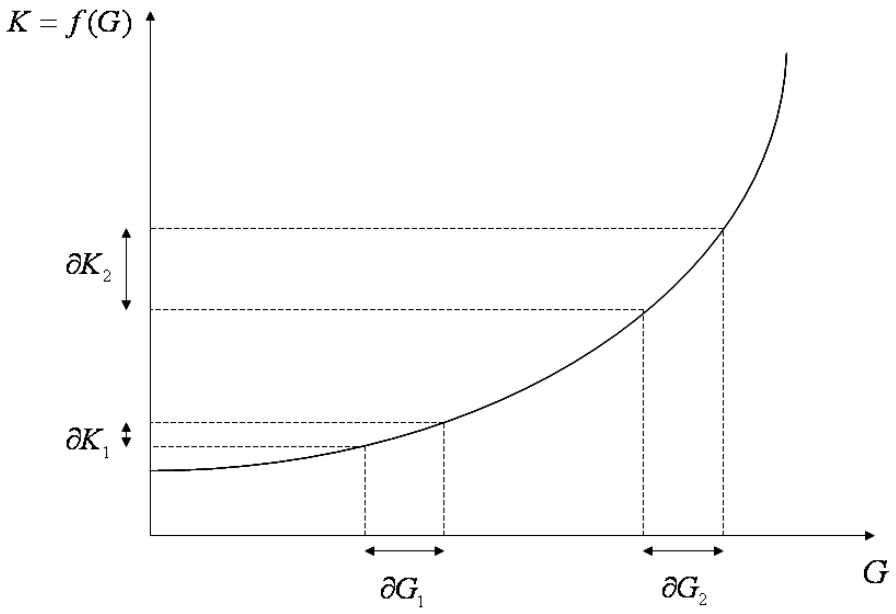

Figure 21.3.: The Range of Rising Cost Function

than it could if the group was still small. The payoff from acquiesce is, by definition of the point G^{**}, negative. However, the absolute value that this loss can take, i.e. the potential net loss from membership, is also an increasing function of G. The larger the group gets, the more likely it becomes that the rational choice of a member would be not to tolerate the aversive membership situation. If tolerance towards aversive situations is an expression for loyalty of the members or the cohesion of the group, then the loss of group cohesion adjunctive to its growth, is actually becoming apparent.

21.4. An Empirical Model for the Influence of Group Size on Exit and Voice Preferences of Individual Members

For the first stage of the following decision model we need to differentiate between two possible situations: first, when (1) $G > \gamma_j^* \Rightarrow Cv > Ce$, and second, when (2) $G < \gamma_j^* \Rightarrow Cv < Ce$. If situation (1) is the case, the member chooses the option of exit and leaves the group. The resulting payoff for the member is then $-Ce$. In case situation (2) occurs, the rational choice of the member would be the option voice, in which case the member's payoff is $\Psi_j^{G^{**}} - Cv$. This payoff is either positive or negative, whereas, as shown in figure 21.2, the bigger the group the higher becomes the probability that this payoff is negative, and even worse than the payoff of exit. For the second stage we need to compare the first two options, exit or voice, with the option to acquiesce. The payoff from acquiesce is, by definition of the point G^{**},

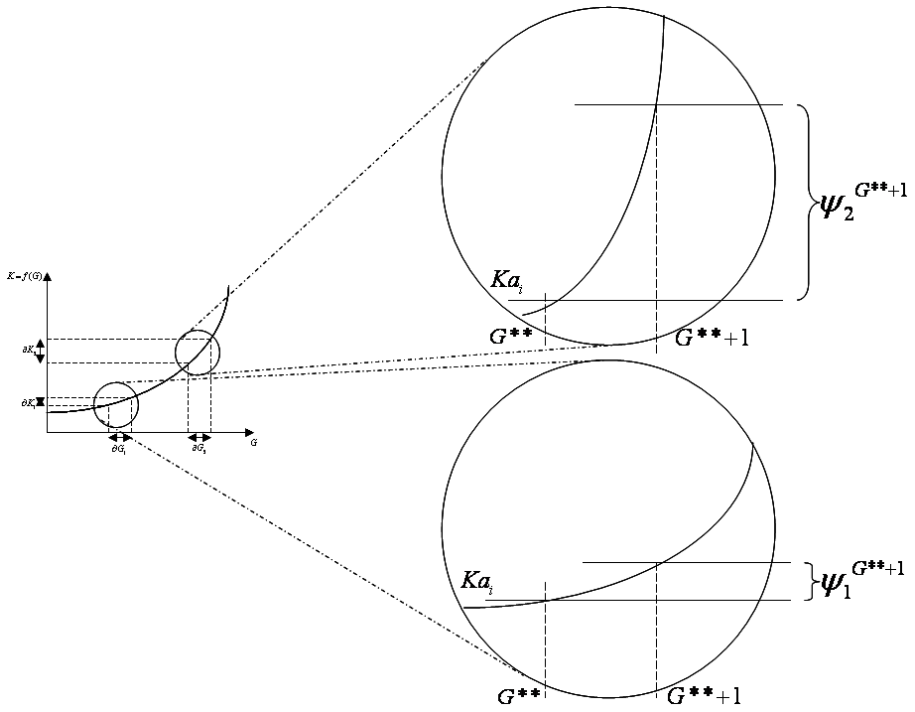

Figure 21.4.: The Different Values of Possible Negative Utilities from Membership as an Effect of the Number of Group Members

negative. However, the absolute value that this loss can take is also a function of G. Although we can not formulate a rule for the advantage of one option over the other, since these are determined by the concrete situation and by random factors, we can claim a rule about the effect of membership size on the advantage of any particular choice over the other: The larger the group of co-operative members, the higher is their rational tendency to exit and leave the group rather than to accept its development or to raise protest and try to influence it [Lasowski & Kühl, 2008].

CHAPTER

TWENTYTWO

AN EMPIRICAL MODEL FOR THE RESTRICTING INFLUENCE OF MEMBERS' PREFERENCES ON THE GROWTH OF COOPERATIVE GROUPS

In chapter 21 of this book we have demonstrated the options which any group-member faces, in the general case of dissatisfaction from membership, and the existence of an alternative. After having formulated the rationality and limited value of membership in chapter 21, we shall now consider the size of the group itself as the mere cause for members' dissatisfaction, and the way the frequency of this dissatisfaction and the behavior of the members accordingly, restrict the growth of the group.

22.1. The Influence of Group Size on the Frequency of Members' Dissatisfaction

Let us imagine a group, which is in a constant process of growth. For the sake of simplicity we assume that every morning a new potential member is standing at the door, wishing to join the group. Assuming also, that the cooperative production quantity must be extended by a uniform quantity for every entrance of a new member, the cooperative production costs caused thereby grow exponentially:

$$\frac{\partial M}{\partial x} > 0, \tag{22.1}$$

$$\frac{\partial K}{\partial x} > 0, \quad \frac{\partial^2 K}{\partial^2 x} > 0 \tag{22.2}$$

Figure 21.3 in section 21.1 in chapter 21 features the procession of the average total costs of the cooperative, as the group expands.

The abscissa in the diagram presents the expansion of the group. The ordinate measures the average total costs for the cooperative caused thereby. Figure 22.1 is an expansion of figure 21.3 in section 21.1, in the sense that it additionally expresses the

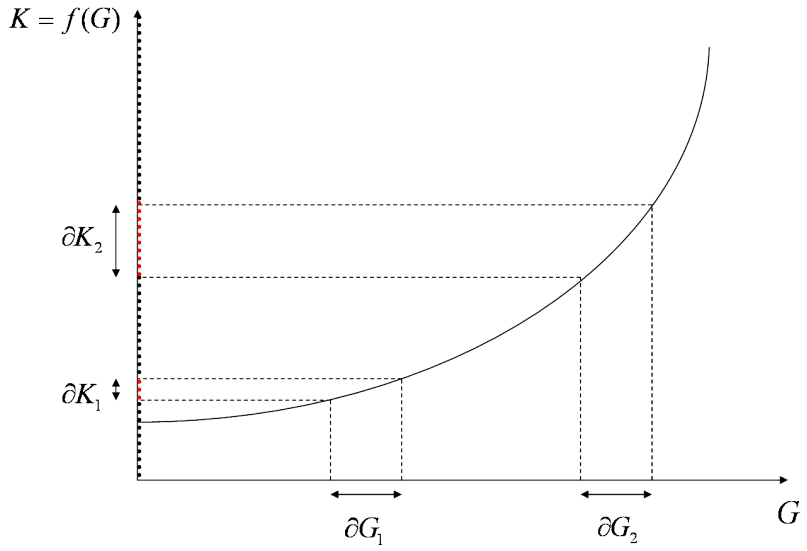

Figure 22.1.: The Members' Alternative Average Total Costs Exceeded by the Average Total Costs of Cooperation

distribution of the group members along the ordinate according to their alternative average total costs; the costs for which they could alternatively produce or purchase the same product or service that the cooperation provides them. Let us assume that each point on the ordinate presents the alternative costs of one member. For the sake of simplicity we assume[1] a uniform distribution of the group's members along the ordinate. It immediately becomes obvious, that the number of members, whose alternative costs are exceeded by their share on the cooperative costs, is growing exponentially with the growing of the group (see figure 22.1):

$$\frac{\partial K a_1}{\partial G_1} > \frac{\partial K a_2}{\partial G_2} \tag{22.3}$$

Each producer, whose share in the cooperative costs has exceeded his or her alternative production costs, needs to make a decision at that point. The group's size has reached its limit for this member; any further growth would cause the exceeding of his or her price-threshold. At this point the member is due to decide whether to exit the group or to protest against its expansion. If the member chooses to exit, the number of members in the group drops shortly. But the group accepts the new member and evens up its size. At that point, the number of group members

[1]Yet, if we relax the assumption of uniform distribution of members on the ordinate, and assume instead: 1) The structure corresponding to Gibrat's law, according to which firm size distribution in markets features a small number of big producers and a relatively greater number of smaller producers [Sutton, 1997] and 2) the smaller producers would typically have higher alternative production costs, so that the density of members becomes higher along the ordinate, then we can expect an even stronger increase in the number of members, whose alternative production costs are exceeded with each expansion of the group and its production.

reaches its initial size again, which would have justified for the exiting member to remain in the group. It might therefore be favorable for the member to choose the option of protest, depending on the costs and benefit that such a protest might cause.

In case the member chooses the option "voice" and raises protest, there is a chance that this protest would be effective, and that the entrance of the new member into the group could be prevented. This chance is depending on the total number of group members and on the relative share of the protesting member in the total production. The bigger the group is, the smaller is the chance to influence it. However, the bigger the relative share of the objecting member in the total cooperative production, the greater is the influence he or she might have on the group. The member would therefore succeed to prevent more new entrances, and hold up the growth of the group for a longer period before exiting. In case the protest is successful, the protesting member has his or her aim achieved, he or she remains member in the group and the group maintains its size G.

If the protest is not effective, the new member is being accepted and the number of members in the group shortly rises to $G+1$. The unsuccessfully protesting member exits at this point and the number of members drops back to G.

The outcome of this strategic decision is therefore for the growth process of the group insignificant. Whether a new potential member is rejected, or one of the group members exits, the consequence for the growth of the group is one and the same; the growth process stalls. However, as demonstrated at the beginning of this section, the feature that does change with the expansion of the group is the frequency of these occurrences, and the number of new potential members who are rejected, before the group member who is objecting to the further growth exits. The frequency of occurrences is a function of the total average production costs of the cooperative. The number of times a member can prevent the acceptance of a new member is a function of his or her influence in the group. The total average production costs and the influence of the single member in the group are both functions of the size that the group has reached[2]. The next section will feature the implication of these recognitions to characterize a theoretical model for the growth of cooperative groups.

22.2. The Resulting Growth Characteristic of Cooperative Groups

The resulting development of the number of group members is illustrated in the following figure 22.2. The figure illustrates the development in the number of group members over time. As shown in section 21.2, whether an unsatisfied member chooses to exit the group or to object to the entrance of a new member, does not change the final resulting change in the number of the group members at the end of the process. However, successfull prevention of new member entrances, might delay the growth of the group for a longer period than an imediate exchange of old against

[2]For a detailed analysis of these dependencies refer again to section 21.4

new members. The growth curve Gv in figure 22.2, illustrates the process of growth, resulting under the assumption of no influence of the members on the decisions of the group. namely the chance for effective protest set as null, so that each point of dissatisfaction, results in a member exchange and, therefore, one time-unit delay in the process of growth. At each point of the growth curve, where one of the members raises objection to further growth, we obtain a delay of one t-unit in the growth (marked in figure 22.2 as ∂t_W). These incidents of member's dissatisfaction occur increasingly frequent as the group grows and its total average costs, as already noted in section 21.1 of this book, rise. As the frequency of member's dissatisfaction rises, as argued in the previous section 22.1, the growth of the group becomes ever more slowly over time, so that the number of the members in the group converges to a certain limit. Curve Gs presents the continuous approximation of the growth and line G^* its limiting asymptote.

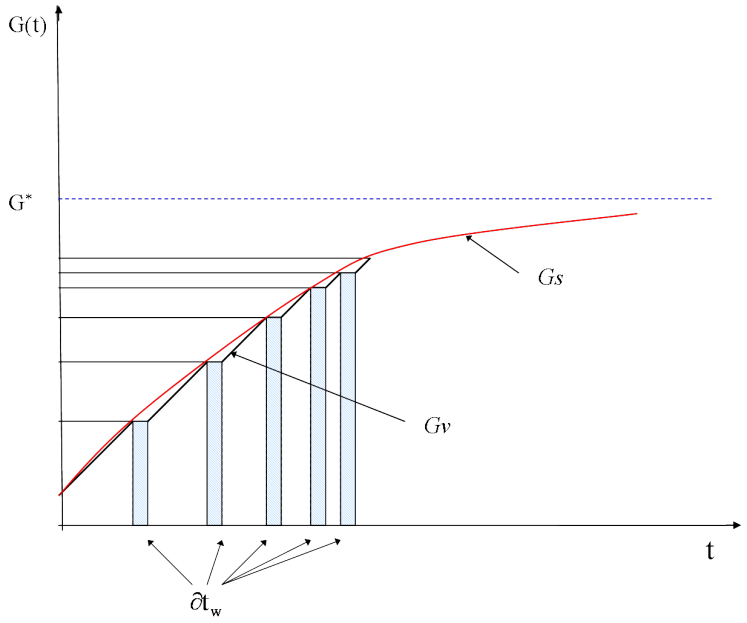

Figure 22.2.: The Change in the Number of Cooperative Members over Time, under the Condition of No Member Influence on the Group

However, we do expect the members in the group to have a certain influence on decision making, especially as long as the group is still relatively small. This influence applies a certain chance for an effective protest against the entrance of new members. An unsatisfied member can thus prevent the entrance of a new candidate over a few time periods (days, in our theoretical construct of one new candidate a day), before he or she is forced to exit the group. The influence of the single member on the group is therefore expressed by the length of period that he or she manages to stall the further growth of the group before exiting. Since the influence of a single member on the group is assumed to decrease with the increase in the group's size, this period of growth stall becomes shorter, the larger the group

becomes. This declining distortion effect enforces an adjustment of the early stages of the growth process, which results in a sigmoid curve, which converges to an upper limit. Figure 22.3 illustrates the situation, given an existent influence of the members in the group. Like in figure 22.2, curve G_v illustrates the process of group growth as a function of t. At each point of the growth curve, where one of the members raises his objection to further growth, we obtain a delay of ∂t_I in the growth, additional to the unit-delay ∂t_I. Under the assumption of members' influence, the total delay is longer than in the previous case, by the factor of the member's influence ∂t_I. The length of the delay caused by the members' influence ∂t_I decreases, whereas the incidents of dissatisfaction occur, like in the previous model, increasingly frequent as the group grows and the total average costs of the cooperative production rise. Curve G_s presents the continuous approximation of the growth and G^* its limiting asymptote. The dotted curve G_s0 in figure 22.3 is the growth curve without the effect of members' influence, taken as a reference from figure 22.2 to demonstrate the change in the process of growth due to influence.

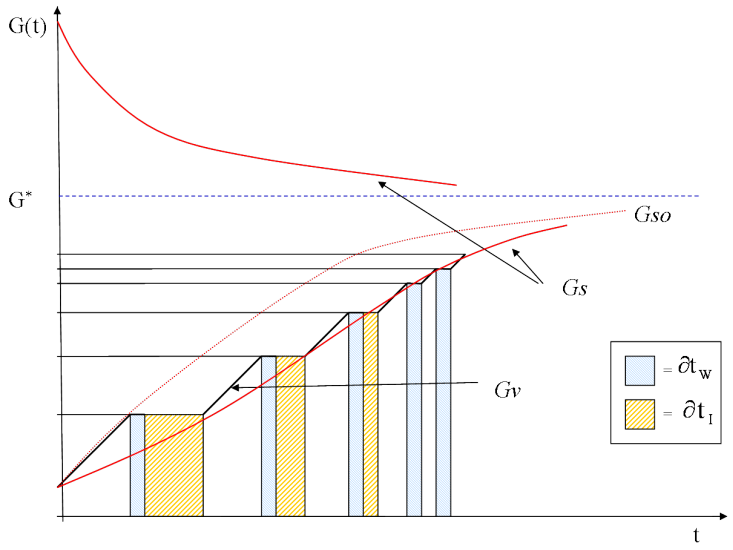

Figure 22.3.: The Change in the Number of Cooperative Members over Time, under the Condition of Member Influence on the Group

The growth processions, illustrated in figures 22.2 and 22.3, as logical conclusions resulting from the thought experiment conducted up to this point, are translated into mathmatical terms in the following section 22.3, in order to create the empirical mathematical model of group-growth as a process of member osmosis.

22.3. A Mathematical Model for Members' Osmosis into the Membership Idea

This section introduces an empirical mathematical model for group growth as an osmotic process. It features the implementation of the recognitions achieved in theoretic model, developed in the preceding sections of this chapter, into the osmotic concept of ideas-evolution, formulated in chapters 15 and 16 of this book. Consider group-membership as an idea. Actors who choose to adopt that idea, enter the group in a process of osmosis, in which the the actors operate as the solvent and the idea as the solute. The motion of actors from the position of non-members, through the borders, into the hypothetical space of membership-idea, is expressed using the model of the classical cell-osmometer [Philip, 1958]. For that purpose, we need to immagine the group in an analogy to a spherical cell, featuring a defined border analogue to the cell wall, with the following properties:

- The geometrical limits of the group.
- The mechanical strength and elasticity supporting the turgor pressure.
- The semi-permeable membrane.

Formulating the dynamic model of the classical cell-osmometer for the case of the group, we need to introduce the following symbols:

- G, the instantaneous group size analogue to the volume of the osmotic cell. Measured as a product of the number of group members and a unit spherical volume. attributed to each member. G_0 presents the initial group size at the point of minimal total average production costs of the group-enterprise, where we set the time as $t = t_0$.
- $g = G/G_0 - 1$, the relative depature of the group size (i.e. cell volume) from G_0.
- A the surface area of the group borders. A_0, the value of A at zero turgor pressure.
- L_p, the premeability of the membrane to members.
- Φ, the osmotic pressure of the solution[3]. This osmotic pressure is analogue to the osmotic potential gradient and expresses the groups attraction of new members.

[3]The solution in our analogy consists of the actors in the system being the solvent, and the idea of membership, being the solute. The membrane is defined as featuring zero premeability to the solute. That means, following the concept of osmosis of ideas formulated in chapter 16, that the actors who choose to adopt the idea of membership, enter into the volume within the borders of the cell, whereas those who abandon the idea exit the cell.

- ϵ, the elasticity modulus of the cell wall.
- T, the turgor pressure within the cell, as a function of the surface area of the spheric cell A and the elasticity modulus of the cell's border ϵ. The turgor pressure at t_0 is assumed to be zero.

Utilizing the defined symbols, the process of group-growth through members' osmosis into the space of the membership idea, can be expressed through the following equation:

$$\frac{dG}{dt} = L_p A(\Phi - T) \tag{22.4}$$

Subject to the initial condition

$$t = 0, G = G_0 \tag{22.5}$$

We assume, that each member has the equivalent volume of one unit. The total volume G of the group is therefore the sum of volumes of all members. We also suppose that, initially, $T = 0$, as there is still no point of dissatisfaction occuring within the group up to this point (as every extension of the group only caused further decrease in the total average costs faced by the group).

Equation 22.4 cannot be integrated as it stands. However, L_p, A, Φ and T, are all generally functions of G. If these functions are known, equation 22.4 can be integrated. In order to solve the problem analytically, certain approximations are necessary.

The permeability of natural membranes is expressed as the flux of solvent pro unit of time, pro unit membrane surface area and potential gradient. The permeability of the group border to members is an outcome of the rule of acceptance of new members, and the influence of existing members on the group. Exclusive clubs, for instance accept or reject new membership through democratic decision procedures. Co-operatives are basically open memberships, at least under German law. However, members of the co-operative can stress their objection to further expansion of the group and create internal pressure against it. We first assume zero influence of the members on the acceptance of new members, which means a random outcome of either new members being rejected or existing members exiting the group in case of dissatisfaction. For that reason we set L_p as constant (which we shall alter later on).

Assuming a spheric space for the membership, the surface area of the border increases with the volume of the space as according to the function

$$A(G) = \sqrt[3]{36\pi} G^{\frac{2}{3}} \tag{22.6}$$

As seen form equation 22.6, for a volume G large enough, an increase in the volume is not likely to change the order of magnitude of $L_p A$, which affects the time

scale of the osmometer dynamics, though not its general character [Philip, 1958]. For simplifying the analysis, we can therefore consider L_pA as a constant equal to L_pA_0.

We defined Φ as the group's attractiveness to new members. For this analysis we assume an infinite source for new members. Since the adaptation of the membership-idea implies entrance into the space of the group, we exclude the option of remaining outside the group and benefitting from its performance. The number of actors sharing the same idea, does not change ceteris paribus the utility from the idea. Since the entrance of members does not change the osmotic potential within the group borders, the gradient of potentials, drawing the members from outside into the group is supposed to insignificantly change with the growth of the group, and therefore, to remain constant.

The remaining component of equation 22.4 to be considered is the turgor pressure T, which is the pressure resisting the motion of members into the group-space, or pressing others out of it. While we assumed a constant gradient, pulling members from the environment into the group, as argued in the theory, growing dimensions of the enterprise run by the group, raise the average total costs of production over-proportionally. It is for that reason, that the turgor pressure within the cell rises proportional to its volume. This hydrostatic preasure analogue within the cell, causes the exit of new and old members[4] back to the system environment. We can therefore observe this pressure as the frequency of occurance of dissatisfaction situtations as a result of group's expansion, i.e. this frequency is a function of the average total costs function, which is in its turn a function of the group's expansion. The relation of T to the group's expansion is expressed through the elastic modulus of the cell ϵ, so that

$$T = \epsilon g \tag{22.7}$$

which is to be empirically determined for the specific group according to its respective average total costs function. We can hence rewrite equation 22.4 as:

$$\frac{dG}{dt} = L_pA_0\Phi - L_pA_0\frac{\epsilon}{G_0}G + L_pA_0\epsilon \tag{22.8}$$

For simplicity of writing in the next steps, we substitute a for the constant expression $L_pA_0\frac{\epsilon}{G_0}$ and b for $L_pA_0(\Phi + \epsilon)$. Rearranging, we obtain the linear differential function

$$\frac{dG}{dt} + aG = b \tag{22.9}$$

The solution of which would be

$$G = C\exp(-at) + \frac{b}{a} \tag{22.10}$$

[4]In the absence of explicit influence of the persistent members over the acceptance or rejection of new members, we consider a random determination of which members flow out, the new or the old.

where C is an arbitrary constant. Letting $\frac{dG}{dt} = 0$ and solving for G, we can observe that the solution 22.10 converges to b/a as $t \to \infty$, corresponding to figure 22.2 in section 22.2.

Substituting a and b with their original expressions, we receive the function of group growth over time

$$G = C\exp(-L_p A_0 \frac{\epsilon}{G_0} t) + \frac{L_p A_0(\Phi + \epsilon)}{L_p A_0 \frac{\epsilon}{G_0}} = C\exp(-L_p A_0 \frac{\epsilon}{G_0} t) + G_0(\frac{\Phi}{\epsilon} + 1) \tag{22.11}$$

and the asymptote of the growth appears as $G_0(\frac{\Phi}{\epsilon} + 1)$. We can obviously see, that the maximal size of the group is a function of its initial size G_0 at $t = 0$, and the relation between its attractivity to new members Φ and its elastic modulus ϵ, i.e. its "internal resistance" to growth.

Based on the initial osmosis function 22.4, we now introduce the element of member-influence into the process of growth. The influence of an unsatisfied member can cause the rejection of a new member at the border of the group. The higher the influence, the longer is the period, and therefore the higher is the number of rejected new members, before the unsatisfied member leaves the group. The quote of prevented new entrances, out of the total of entrance attempts, is therefore a resulting measure for the permeability of the group's border. Other than in the first model, in which we assumed a constant permeability of the border, under the assumption of member-influence, the permeability, as an expression of the declining member-influence, is increasing as a function of the group's size. In order to quantify it in economic terms, member-influence on decision-making in the group is expressed by the costs of pivoting an election (corresponding to the costs of "voice", illustrated in section 21.3). Simplified[5], we assume a linear dependency between the permeability and the group's size, with the ratio coeficient γ, so that:

$$L_{p(G)} = L_0 \gamma G(t) \tag{22.12}$$

whereas L_0 is the permeability of the border at t_0. Hence, the higher the costs of comunication or the number of members in the group, the lower is the influence of the individual members and the decision-making of the group, and therefore, the higher is the permeability $L_p(G)$. Inserting $L_p(G)$ into the osmosis function 22.4, we obtain the differential equation for group growth under changing member influence[6]

$$\frac{dG(t)}{dt} = L_{p(G(t))} A(\Phi - T_{(G(t))}) = (L_0 \gamma G(t)) A(\Phi - \epsilon(\frac{G(t)}{G_0} - 1)) \tag{22.13}$$

Rearranging, we obtain

$$\frac{dG(t)}{dt} = L_0 \gamma G(t) A(\Phi - \epsilon \frac{G(t)}{G_0} + \epsilon) = L_0 \gamma A(\Phi + \epsilon) G(t) - \frac{L_0 \gamma A \epsilon}{G_0} G(t)^2 \tag{22.14}$$

[5]For an extensive consideration of the costs of pivoting the result of an election and their dependency on jurisdiction size, refer to [Taylor & Yildirim, 2005], and [Borck, 2002].

[6]For deeper disquisition of the mathematical methodology here, refer to e.g: [Vogels *et al.*, 1975] and [Krabs, 1997].

Applying the substitutions

$$a = L_0\gamma A(\Phi + \epsilon), b = \frac{L_0\gamma A\epsilon}{G_0} \tag{22.15}$$

we obtain the simplified linear differential equation:

$$\frac{dG}{dt} = aG(t) - bG(t)^2 \tag{22.16}$$

with certain constants a, b which fulfill the conditions $a > b$ and $b > 0$. The sigmoid character of the growth-curve is already visible from the equation. As long as the group $G(t)$ is small enough, the term $bG(t)^2$ is considerably smaller than $aG(t)$, so that equation 22.16 expresses an exponential growth. Only after $G(t)$ has accomplished a sufficient growth, the influence of the term $bG(t)^2$ becomes bigger and the growth converges to a certain limit.

Given the initial group size $G(t_0) = G_0 > 0$ for $t_0 \geq 0$ and applying the method of separation of variables, the following law of growth can be derived:

$$G(t) = \frac{aG_0exp[a(t)]}{a - bG_0 + bG_0exp[a(t)]} \tag{22.17}$$

As in the previous model, the growth function converges to a certain constant:

$$\lim_{t\to\infty} G(t) = \frac{a}{b} \tag{22.18}$$

This is the constant limit to growth, which appears in figure 22.3 as the limit size G^*. Substituting the constants a and b with their original expressions, as defined in 22.15, we obtain the same value for the asymptote, known from the model without member-influence: $G_0(\frac{\Phi}{\epsilon} + 1)$.

In addition to that it becomes apparent, that the size of the group $G = G(t)$ is a monotonous increasing function in $t \geq t_0$, when $G_0 \leq \frac{a}{b}$ and a monotonous decreasing function when $G_0 \geq \frac{a}{b}$. Thus the intuitive expectation is expressed, that the group would adjust its size downwards in case of - for instance - a shift of the asymptote due to changes in the market situation, or in case the group is suddenly bigger than its asymptotical size after a merger between two cooperatives. The members would react to the new cost-benefit situation and adjust their number to the new optimum accordingly. Moreover, for the case $G_0 = \frac{a}{b}$, in which the number of members at the beginning of growth measuring complies with the limit of growth under the given circumstances, the size of the the group does not change over time, so that $G(t) = \frac{a}{b} = G_0$ for all $t \geq t_0$.

The inflection point t_s of function $G = G(t)$ follows from the demand $\ddot{G}(t_s) = 0$. The differential equation yields:

$$\ddot{G}(t_s) = a\dot{G}(t_s) - 2bG(t_s)\dot{G}(t_s) = (a - 2bG(t_s))G(t_s)(a - bG(t_s)) = 0 \tag{22.19}$$

Therefore in case $G_0 > \frac{a}{b} \Rightarrow G(t) > \frac{a}{b}$ for all $t \geq t_0$, no inflection point is possible. In case $G_0 < \frac{a}{b} \Rightarrow G(t) < \frac{a}{b}$ for all $t \geq t_0$, only one inflection is possible, which is the solution of the equation: $G(t_s) = \frac{a}{2b}$.

The parameters a, b of the growth law 22.17 are determined by the distribution of the members' alternative production costs and by the procession of the total average production costs of the cooperative. These are hard to calculate, but may empirically be found through the choice of three points $t_1 < t_2 < t_3$, so that $t_1 > 0$ and $t_2 - t_1 = t_3 - t_2$, and the calculation of the values $G(t_1)$, $G(t_2)$ and $G(t_3)$. That way, with a relatively small amount of data, a growth process of an observed cooperative can be analyzed to determine its mathematical function – and by that – its limit of growth can be predicted.

CHAPTER

TWENTYTHREE

CONSEQUENCES OF THE LIMITED GROWTH FOR COOPERATIVE PERFORMANCE EVALUATION

The models of group growth formulated in the preceding chapter 22 point out the notion, that a group of co-operating agents features a limited ability to grow, which lies at the base of its very own nature. This feature implies an adaptation in the evaluation of co-operatives' performance. In this work we observe the co-operative as a group of individuals, in which each member influences the behavior of the group as a whole. Using strategic decisions theoretical principles while considering the complex interests of the individual group-members, their strategic choices and the power of the individual to influence the group, we point out that the members limit the growth of their own group. We also show that the natural development of the number of group-members, under set economic environmental conditions, will feature the asymptotic form, which is characteristic to biological growth or thermodynamic osmosis processes. This might stand in contradiction to the common expectation from a prosperous organization to feature a constant growth in order to be evaluated as prosperous. However, just like in growth mechanisms of natural (and human) populations, the number of group members can only be expected to grow and converge to a certain limit, which it would not exceed without a change in its living conditions. Similarly to the availability of space and other resources, which need to be extended in order to allow constant growth of natural populations, limited members' benefits from membership, determine a limitation for the growth of a cooperative group itself. Through their individual decisions and membership behavior, the members regulate the size of their own group.

This attribute of limited growth capability has been recognized and described by several scientists already. However while quite a few authors find a conflict between the interest of the co-operative to extend its membership in order to obtain competitive market positions through economies of scale [Fulton, 1999], or to raise capital [Nilsson J., 2008], and between the danger of losing on member adhesion and commitment, demanding adaptations of management strategies and organization structures to confront this problem [Nilsson J., 2008, Fulton, 1999, Butler & USDA, 1988], we relate a rather self regulative characteristic to the co-

operative in its environment. For this purpose we observe the co-operative as a population and its behavior as the behavior of the sum of its members. Also the performance of the organization is therefore just as good as the sum of its members is wishing it to be. Those particular members, who are not satisfied with the performance of the group to the extent that they prefer an alternative, and for whom the cost-benefit relation of attempting to influence it is disadvantageous, exit the organization. We can therefore claim (and many empirical surveys seem to support this) that the members are basically satisfied with their group. This empirical result is not very surprising as long as surveys consider only the population of individuals who are members of the organization at the point of time when the survey is being conducted. Those who are (really) not satisfied with membership are not members (anymore). As contrary to the tendency of organization performance-evaluation concepts, which often name growth as a necessary indicator of success, a non growing group should not be considered as unsuccessful. For the sum of its members it is actually just as successful as it could be considering its environmental circumstances.

The net number of group members is therefore only an external characteristic of the organization. Even after the group has accomplished its phase of growth and the number of its members does not seem to change, the movement of members into, through and out of the group still continues as an internal activity of the vivid organization [Lasowski & Kühl, 2009]. Consider a schematic market environment as illustrated in figure 23.1. The market environment is illustrated as a pool, in which a population of enterprises of different sizes exist. This pool contains an internal environment within it in form of a vertical pipe, representing the cooperative organization, so that some of the enterprises are located within the pipe and some outside of it. The enterprises within the pipe are representing the group of enterprises which are members in the cooperative.

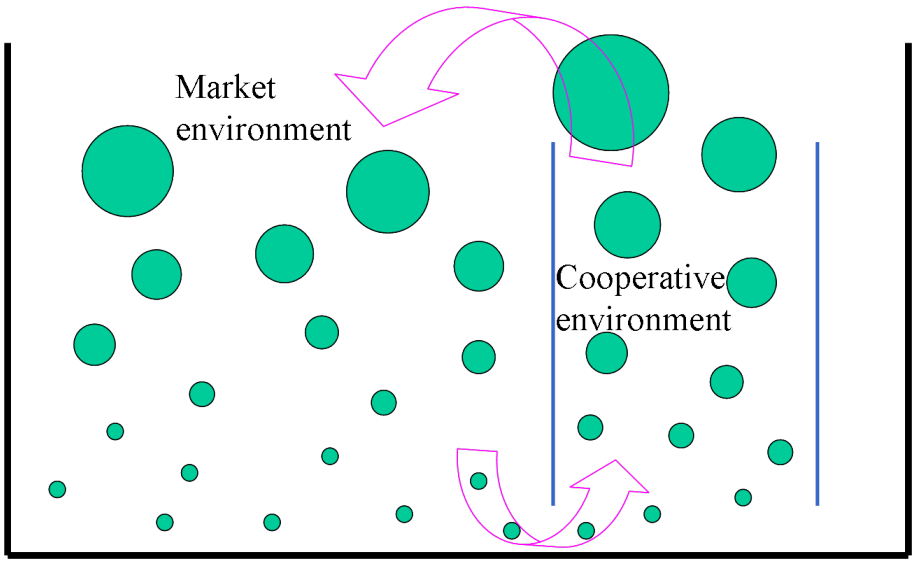

Figure 23.1.: The Cooperative Organization in its Market Environment

While new members, whose opportunity costs are lower and therefore their net utility from membership is positive, continue entering the organization, the total number of members is only balanced by other members who exit it. Those who exit the organization are those members who feature higher market chances and whose opportunity cost of membership exceeds its utility. The logical consequence of this observation is that the organization is performing as a market elevator, where weaker members continuously enter the organization from underneath, whilst stronger members leave it from above and return to the market at a much improved position[1]. This performance of the organization might be latent to the observer at first sight. But if two conditions are fulfilled, namely a constant number of members in the organization and a continuous movement of members "through" it, we can emanate from it that the organization is playing a formidable role in shaping and regulating the market environments within which it acts.

[1]Deriving from the reasoning at the base of this work, no enterprise would enter the organization if it can do better in the alternative market, or leave it if it has an advantage within the organization over acting on the market

CHAPTER

TWENTYFOUR

CONSEQUENCES OF THE LIMITED GROWTH FOR COOPERATIVE MANAGEMENT

The co-operative is by its nature, not only a form of enterprise governance, but also a group of individuals who join their forces in order to fulfill a common economical purpose. By serving a common cause, the members of the group also fulfill a series of personal - non economical - needs. The accumulation of these needs is the glue holding co-operative organizations together, usually recognized as members' commitment. Agricultural and food markets are undergoing a constant change, as borders break down, trade barriers fall and multinational market actors are entering market they have traditionally ignored. Modern retail markets are increasingly characterized by highly concentrated structures. Agricultural markets feature increasing industrialization and a liberalized trade. These processes set major structural challenges for co-operatives as they are forced to respond by merging and finding new ways of raising capital. In order to keep up with competition and to maintain their bargaining power in these markets, co-operative market-actors are forced to expand their structures to ever growing dimensions. While serving the cause of maintaining competitiveness, increasing the size of the group has a negative influence on the group-perception of the individual member. The glue holding these groups together is loosening as a direct result of organizational growth.

One could wish to find the solution for that conflict in the process of concentration, observed in many markets. Ever growing market shares are controlled by a decreasing number of market actors, which, however, are increasing in size. This can be observed in the development of the inner structure of many cooperatives as well, where the numbers of members are declining and at the same time the cooperative enterprises maintain their sizes or even grow. However this process conceals a danger in it. Striving for a relative small group of "larger" members might lead to a self selection of groups, where members who possess an economical advantage split from the main group to create exclusive groups of their own and thus, contrary to the original ideas of the co-operative movement, exclude "smaller" economically weaker members. Therefore it is and should be the challenge of the co-operative management, to extend and expand the co-operative enterprise without losing on

members' commitment at the same time.

This recognition is crucial first of all for the mere understanding of group-dynamics in general and of the co-operative group in particular. Moreover, it is essential for understanding the difficulties and limitations co-operatives face concerning their ability to keep up with structural challenges created by modern food and agricultural markets. And finally, this recognition is crucial for the correct conception of imperatives for the design and adaptation of management tactics and strategies for growing co-operative groups.

Part V.

Conclusion

CHAPTER

TWENTYFIVE

SUMMARY

The initial motivation for this work has been to explore new alternative perspectives for the assessment of co-operative organizations. This special species of enterprises features a unique attribute, deferring it from all other enterpreneural forms. It is constructed of a group of individuals, with all the psychological and social consequences. This unique feature of this type of organization has enabled the special examination conducted in this work; the analysis of the organization from a population ecological perspective. Part II of this work attempts to illustrate this special feature and justify conducting the examination of the subject from a population evolutionary perspective.

Trying to imply the term *populations ecology* into a socio-economic context, it is unavoidable to confront several issues. The first of those is the association of this term with its common use in the organizational economic context, which almost automatically leads the line of thought along the conventional patterns. Ever since the publishing of Hannan and Freeman's work [Hannan & Freeman, 1982], populations ecology has been used by organizational economists to describe the dynamics of organizations populations in their market-environments, attributing a feature of a life cycle to organizations and utilizing this forced feature to describe and explain market dynamics. In this work, the evolutionary logic has been utilized to explain the dynamic existence of the organization itself. The population referred to in this work is the population of different ideas, among which the idea of organization membership. To population of members and non-members serves here as the analogy to the actual selecting environment.

A second issue to be confronted is the tensioned relationship between economics and the life sciences, which comes to its full expression in the context of the use of evolutionary logic. In an attempt to release some of this pressure and to encourage a more intensive exchange of understandings and ideas between socio-economic and life sciences, several resent developments and recognitions of life sciences have been illustrated, which surprisingly reduce the logical discrepancies between the disciplines. Part III of this work features the treatment of evolution in life and social sciences, and suggests a new concept for evolution and the population ecology of

ideas, combined with its application to the special case of the group membership idea.

Part IV of this work features the implementation of the recognitions, achieved in the preceding parts, into an empirical model that analyzes the behavior of individuals considering the membership in a co-operative group, and the resulting dynamic development process of the group itself. The basis for this model is a simplification of group cohesion into the frame of individual rationality. Membership-incentives are expressed merely through the costs of exit, increasing anonymity and decreasing influence of the individual member on the group are expressed by the costs of voice, and all these are analyzed in the face of opportunity costs, expressed by the conditions offered by a competitor or by other market opportunities. These three elements are sufficient for demonstrating that the tendency of members to leave a co-operative group is increasing as the group grows. This notion is satisfactory for the justification of an analogy of organizational dynamics to biological growth models [Lasowski & Kühl, 2006], whereas the growing tendency of individuals to leave the group is – in its sense – nothing else than the analogue of increasing death rates in growing populations.

Classic Organizations theory is devided into two main modelling approaches: The "rational" and the "natural" perspectives. The rational instrumental approach relates to organizations as instruments that could be consciously designed to achieve defined goals and ends. The assumption at the base of this approach is that organizations can be rationally planned and shaped to achieve their goals, and that the goals, the means to achieve them and the resulting development of the system can be controlled by participants. By contrast, the natural perspective observes organzations as organic systems, underlying spontaneous, indeterminate processes. This work takes on the lead of modern organizational theory, emphasizing mechanistic rationality and at the same time natural organic principles. Developmental processes are illustrated as the outcome of a complex of meta processes, which are not totally controllable as an instrument in the hand of a dictating entity. However, just as well as natural processes, organizational system developments feature regularities, which may be empirically studied, understood and even implied for reaching predefined goals. Therefore, even if we agree that social systems feature natural organic attributes and there is therefore only a limited possibility to controll its outcomes, there is still a great necessity to learn the regularities in the system mechanisms. Figuratively put, natural scientists are certainly not able to control a hurican approaching a city. But if they learn the regularities typical to the meteorological system, then they can better estimate the hurican and predict its intensity and evacuate the city on time to influence the storm's consequences. In that sense, concerning social systems as organic should direct their investigation to better understanding of the regularities at their basis. And the recognitions achieved by these investigations, should be implied into imperatives enabling better instrumentalization of organizational systems.

That is probably the main achievement of this work. It features the application of available recognitions concerning co-operative organizations and their hybrid

character as social groups and economic enterprises. Through the formulation of the impact of social and economic mechanisms in quantitative economic terms, a general formal expression of the group development process is being achieved. This expression enables the application of established mathematical growth models as an instrument for the assessment of group performance, and for the generation of liable prognoses considering the development of co-operative groups in the future. Moreover, observing the organization and its members from an evolutionary – populations ecological – perspective, delivers a powerful instrument and at the same time a new perspective for the assessment of co-operative and perhaps other organizational performance.

CHAPTER

TWENTYSIX

FUTURE PERSPECTIVES

Economic sciences enjoy an advantageous positioning at the overlap between social and life sciences. Traditionally, the relation to this positioning is limited to the application of mathematical methods and instruments for the analysis of the socio-psychological phenomenon called economics. However, other social sciences serve themselves increasingly from advances in life sciences and technologies. Psychology itself seems to become evermore clinical, employing the recognitions of neurobiology and new technologies of brain scanning, bio-chemistry and medicine. Despite an increasing penetration and development of psychological methods of behavioral research, and the application of clinical technologies of brain imaging, there is still a remarkable (perhaps traditional) resistance which seems to exist for the acceptance of clinical perspectives into economic disciplines.

It would be tragic if that should remain the case. Economic scholars could gain from contemporary advances in life sciences, if they cease to reject the penetration of clinical mind research into the schools of economics and, instead, seek for increased dialog and mutual inspiration with psychological, medical and clinical researchers.

Nevertheless, there have been great achievements reached by contemporary experimental neuroeconomics. Thanks to advances in neurologic brain mapping and bio-psychology, and the integration of behavioral economics, researchers could detect and locate different cognitive and emotional reactions and interactions of the distinctive responsible brain areas to economic stimuli. Observations of behavioral experimental economists could be observed, confirmed and supported by neurologists. However, due to technical limitations of the measurement instruments available at the moment, the observations are limited to snap-shots of brain regions and their reactions. There is still a broad field for further developments in the imaging of the flow of consequent emotional and cognitive activities, reactions, interactions and decisional processed of the brain and its different areas. An improved temporal resolution and rendering techniques would enable researchers to pinpoint the influence of triggering stimuli and reaction processes and their advance throughout the neurologic and endocrinologic systems.

An immediate matter for investigation that could be delivered through this work,

is the process of stress reaction to decision situations, as formulated through the general logic scheme for strategic decisions created in chapter 18 of this work. According to this scheme, every strategic decision is a combination and configuration of elements from two decisions-dimensions: The first dimension is the choice of environment (Go where?). The second dimension is the choice to either adapt the environment of activity or to adapt oneself to the environment (Do what?). This general scheme applies to any imaginable strategic decision, whether it is the case of economic decisions, the decision to maintain a marriage, belong to a group or accept a complex of ideas (exit-voice-acquiesce decisions) or even survival-relevant decisions in a fight-flight-cope decision situation.

Fight-flight-cope decisions are being conducted in high stress situations. Neurological experiments of decision making processes have yielded several recognitions considering the influence of stress on decision making mechanisms, whereas behavioural economic experiments delivered evidence concerning the influences of stress on choices and their resulting successfulness. Other experiments have demonstrated the activation of the major part of the brain, associated with non consciousness, in addition to (in fact even short before) the parts of the brain associated with consciousness and rationality, during the making of very simple (motor movement) decisions. However, there is also psychological evidence that the abundance of choice in modern life makes people less happy. There is therefore a good reason to assume, that not only survival relevant decisions, but also simple decisions and choice situations, trigger the activation of non conscious areas of the brain, in particular those areas of the brain responsible for triggering physiological stress reactions, usually related to fight-or-flight mechanisms.

The main question that is still to be explored is what actually happens first? Is there a mechanism evaluating whether a decision situation is acute or not, and then determining which areas of the brain are to be activated, or are the same areas of the brain being triggered at any decision-making situation? And if the latter is the case, is there physiological strain being induced on the rest of the organism by the process of decision making, or can regulation mechanisms interrupt and eliminate stress signals from the brain in case these are not justified in the given situation? Does an aversive stimulus cause the activation of fight-or-flight activity modus, which in its turn activates decision making organs? Or does decision making itself trigger the activation of all relevant brain areas, including those which are associated with survival relevant under-stress-decisions? For the determination of causal relationships between decision making and stress, a very precise record of the order of events (stimuli, activation of brain areas, decision and action) in a combined system is highly significant. The solution for these questions wold be to gain insight into the progression of brain reactions during non stressful decision situations (such as the choice between two rewards). The employment of MRI technologies could provide this insight and enable the registration of the loci and order of brain activation.

The recognitions gained through the insight into the physiology of interdependencies between stress and decision making, would have direct consequences for

psychology, personal and organizational coaching, as well as for economics. It would deliver complementing physiological perspectives for the understandings of bounded rationality, consumer choices, finance market behaviour and many others.

The co-operative organization, serving as the central pillar for the construction of this work, is an extensively investigated and a well documented organizational model. As an economic enterprise, the co-operative organization is subject to similar forces, mechanisms and influences as other organization forms existing in their environment. It is therefore not their existence as economic enterprises that makes them unique and interesting. It is rather their inner structure, consisting of a social group of members, which makes them unique. As a voluntary and open membership, controlled by democratic participation of their members, co-operatives feature a well characterized social construct with well defined and formulated play rules. As such, the co-operative delivers a frutile ground for social, psychological and economic investigation.

It is still much more common, that recognitions from other disciplines are derived to advance co-operative research. For example, organizations economics have already been implied to analyse co-operative organizational issues. However, much more recognitions from co-operative research should be derived to advance the understanding of general socio economic issues. For instance, the application of the notion of membership idea into general socio-economic evolution, as conducted in this work, could contribute to the general understanding of social evolution, more than it could contribute to the understanding of the mechanisms shaping the co-operatives themselves. The potential of co-operative research is not concealed in what can still be learned *about* this form of organization. Much more it is contained in what can be learned *from* this form of organization about social groups, individuals and the dynamic interactions between those. Co-operative organizations should therefore draw more attention of additional socio economic research disciplines, other than those directly associated with the co-operative theme at present. The co-operative organization conceals a high potential as a subject for experimentation and analysis, delivering substantial recognitions about such issues as social mechanisms, individual and group interactions and behavior, ecological and evolutionary economics, behavioral and cognitive decision making and much more.

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